THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL XX. Copyright, 1886, TICKNOR & COMPANY, Boston, Mass. No. 565.

OCTOBER 23, 1886.

Entered at the Post-Office at Boston as second-class matter.

CONTENTS.

SUMMARY: —

Preparations for the Paris Exhibition. — The striking New York Journeymen-Plumbers turned Sanitary Inspectors. — Report on the Niagara Park Reservation. — A New Dynamite. — Artificial Rubies. — A Scheme for Completing the Tuileries. . 189

MÜNTZ'S RAPHAEL. — III. 191

BIRMINGHAM TRADES EXHIBITION. 193

THE ILLUSTRATIONS: —

The Rotch Travelling Scholarship Drawings. — Building, New York, N. Y. — Chapel for Holyhood Cemetery, Boston, Mass. Competitive Designs for a $5,000-House. — House, Falmouth, Mass. — House, South Mountain Gap, Md. 194

American Architect COMPETITION FOR HOUSE COSTING $5,000. — IX. . 195

THE TIMBER MANOR-HOUSE OF LANCASHIRE AND CHESHIRE. . . 195

UNHEALTHY CHURCH VAULTS. 196

A SYSTEM OF SEWER VENTILATION. 197

THE WORLD'S FUTURE FUEL. 197

SOME INCIDENTS IN THE LIFE OF H. H. RICHARDSON. 198

COMMUNICATIONS: —

The Point of Greatest Deflection.

NOTES AND CLIPPINGS. 199

TRADE SURVEYS. 200

THE people of Paris have entered with enthusiasm into the project for the exhibition of 1889, which they now propose to call the Exposition du Centenaire, after the fashion of our own Centennial Exhibition, in commemoration of the hundredth anniversary of the first acts of the French Revolution, that wonderful struggle of the noblest aspirations with the accumulated brutality of centuries. As soon as the matter took definite shape a Guarantee Association was formed, to take charge of securing subscriptions to a fund for making good any deficiencies, if the receipts, as often occurs in such affairs, should prove insufficient to pay the expenses. The Association, after calculating the probable costs, as well as the income, of the exhibition, decided to call for a fund of eighteen million francs, or three million six hundred thousand dollars, and in three months this sum has been substantially assured, and more might easily be obtained, if the Association should wish to ask for it. The partial list of subscribers which has already appeared in *Le Génie Civil* is interesting reading, as showing how generally the people who can afford to do so are disposed to aid the project. With us, the railway companies and the hotel proprietors have usually been the most liberal subscribers to great exhibitions, but we find, curiously enough, that in Paris the largest subscriptions are made by the banks, which would appear to have very little selfish interest in the matter. Two of the most generous subscriptions among these, moreover, are made by corporations which lend money only on mortgage of real estate, and having no circulating notes, and no prospect, so far as we can see, of increasing either their business or their security by attracting strangers for a few months to the city, must sincerely regard their enormous subscriptions, of one hundred and twenty thousand dollars each, as sacrifices in the cause of patriotism and civic pride. The names of these two corporations, the Sociéte des Immeubles de France, and the Crédit Foncier de France, deserve to be long remembered, and with them should be joined that of the Banque d'Escompte de Paris, which offers an equal sum, but may, perhaps, hope to get back a portion of it in profits on the increased volume of money which would be likely to pass through its hands. The Bank of France, the rival of the Bank of England in conservative solvency, subscribes one hundred thousand dollars, and five or six local banks offer sixty thousand dollars apiece. The two great retail dry-goods stores, the Grands Magasins du Louvre and the Bon Marché, subscribe one hundred thousand dollars each, and the complete list will probably show similar subscriptions from one or two other establishments of the same kind. The proprietors of the Grand Hotel, which will probably profit greatly by the Exhibition, subscribe only twelve thousand dollars, which seems a small sum in comparison with those set down opposite the names of the banks; but, except the Hotel Bristol and the Hotel Chatham, which give two thousand dollars apiece, and M. Heriot of the Hotel du Louvre, we find no other inn-keepers represented in the first list, unless we include among them the managers of the Etablissements Duval, who subscribe one thousand dollars. A great deal of money is promised by private individuals, among whom the most conspicuous are M. Lockroy, the Minister of Commerce; M. Christophle, the famous Governor of the Crédit Foncier; M. Chabrières-Arlès, tresorier-payeur, or, as we should perhaps say, comptroller of the province of the Rhone; Madame Desgenetais of Paris, and the Count de Germiny, comptroller of the Lower Seine, who give ten thousand dollars apiece, and M. Lavoignat of Paris, who gives twenty thousand. The newspaper proprietors, who are in France usually liberal, and often rich, are, so far, represented only by M. Labon, the director of *La France*, and M. Muller, President of the Council of *Le Génie Civil*, who in their private capacity, we presume, give two thousand dollars each. A few associations of manufacturers, in their collective capacity, subscribe large sums, one very modest one, that of the sausage-makers, offering four thousand dollars; but most of them appear as subscribers only through their members, many of whom have shown exemplary liberality. Among the individual manufacturers or firms, the most conspicuous are perhaps the Mediterranean Iron Company, and M. Marinoni, a machinist of Paris, who give twenty thousand dollars each, and M. Menier, a merchant of Paris, who gives thirty thousand, while the Chaix Printing Company, Christofle, the jeweller and manufacturer of bronzes, the Paris Water Company, the Compagnie des Voitures, Darblay & Son, paper-makers at Essonnes, M. Groult, a miller, and several others give ten thousand each. A few architects, among them M. Laisné, M. Boulanger, M. Fonquiau, M. Courtois-Suffit, and others, appear also as subscribers.

ONE can hardly help thinking of the old proverb, "that when rogues fall out, honest men get their due," on learning that the long dispute between the master plumbers and their journeymen in New York is to be enlivened by a system of espionage, which the journeymen are said to have established, with the view of annoying their former masters by finding out defects in their work, and making complaint to the health authorities. One or two complaints have already been made, which resulted in the condemnation of the work reported upon by the health officers, and it is much to be hoped that the animosity between the factions may continue to gratify itself in this way. If report speaks true of what has happened in other cases of the kind, some of the journeymen can speak with confidence of defects in the work for which their own former employers are responsible, through their recollection of having done the bad work themselves, and we have heard tales of workmen who have unblushingly avowed their own misdeeds when they found that they could get their former masters into trouble on account of them. It is only fair to say, however, that plumbers as a class are much above the meaner tricks of this sort, and we do not doubt that the journeymen's committee of censors really desires to do a service to the public at the same time that it annoys the masters, and so far we wish it success. Whatever assists and enforces good work is an unmixed benefit to the community, and if the journeymen would persevere until all the bad plumbing in New York has been ferreted out, and all those responsible for it held up to scorn, they would earn respect and commendation from the public.

THE first annual report of the superintendent of the new Niagara Falls Reservation gives a most encouraging indication of the benefits which will come from the purchase of the territory around the cataract, and its dedication to the public service. Within the year no less than thirty-one buildings have been removed from the immediate vicinity of the Fall, among them being the six unsightly structures of the Bath Island paper mill. The buildings in Prospect Park, with some small shelters for visitors on Goat Island, which it was thought desirable to retain, have been repaired and put in order, and the walks and pleasure grounds have been cleared and made neat. One result of the conversion of the place to public uses has been a great increase in the number of visitors, and it is believed by those who ought to know best that the forlorn and deserted days of Niagara are over, and that the village will soon recover the gayety and prosperity which distinguished it fifty years ago. To accommodate the growing

multitude of strangers, the approaches to the Falls have been improved, the guard rails in the dangerous portions extended and strengthened, and steps taken toward providing a more convenient access to the Cave of the Winds. A careful examination has shown that the central portion of the Horseshoe Fall has receded two hundred feet toward Lake Erie within the past eleven years, while the average rate of recession of the whole cataract has been about two-and-a-half feet per year. For this reason it is probable that all the constructions at the edge of the Falls will be of a temporary character, but care is to be taken to have them safe and convenient. For the further accommodation of visitors, moreover, contracts have been made for cheap transportation by carriages about the Reservation. It is many years since the exorbitant rates of carriage hire, the tradition of which still persists in the facetious columns of the newspapers, gave place to a very moderate tariff, but even this has been reduced, and a carriage service established which closely resembles the excellent system in use in the New York Central Park. It is gratifying to learn that the Government of the Province of Ontario is likely very soon to take possession of the Canada side of the Falls, and devote it to the public use in a similar way. The preliminary surveys made for the purpose by the Niagara Falls Park Commission of Ontario are completed, and estimates made, which show that the cost of acquiring the ground will be about four hundred and twenty-four thousand dollars, and the Legislature is to be asked at the next session to make the necessary appropriation.

WE are not quite sure whether it is more for the public benefit to encourage amateur dynamiters with political convictions to make personal experiments in the composition of new explosives, or to try to conceal from them the results of scientific inquiry into the subject, but, as there is always a doubt as to the success of efforts at concealment or deception, perhaps it is better to make a virtue of necessity, and point out the excellent opportunities which are now offered to those interested in the suppression of tyranny for making themselves acquainted, at small expense, with the properties of high explosives. It is not long since a process was described for developing the detonating quality of brown sugar, and at nearly the same time appeared a device for converting coal-tar into a substance far more dangerous than gunpowder, and a third invention has now been described, by which a material so innocuous in appearance as common glue can be transformed into an explosive possessing a force comparable with that of nitro-glycerine. The recipe for the preparation of this socialist glue is very simple. The glue of commerce is first soaked in cold water, until it has taken up all that it will, and the resulting jelly-like mass is then melted at a gentle heat, filtered, and mixed with nitric acid enough to prevent it from solidifying again when cold. The glue is then subjected to the action of a mixture of nitric and sulphuric acid, and, after thoroughly washing away the excess of acid with water, is fit for use. We can add nothing to this description, except a suggestion that it might be an excellent idea for those who desire a forcible inversion of the social fabric, by which they should themselves be brought to the top, to provide themselves, for the enlivenment of the meetings of their organizations, with bowls, in which they might amuse themselves by brewing, in a sociable manner, the substance which they regard as the means of accomplishing their end. One of the members, for instance, might be appointed to soak the glue, another to add the nitric acid, and a third to mix the vitriol, while a fourth might with advantage be deputed to apply, by means of the red-hot poker, which would so well typify the ardent sentiments of the fraternity, the gentle heat which, as we are told, is essential to the completion of the intended reactions.

ACCORDING to the *Revue Industrielle*, the European jewellers and dealers in precious stones have within a short time been disturbed by the appearance in the market of artificial rubies, so closely imitating the natural stone as to be practically indistinguishable from it. In fact, as careful analysis shows, the natural and the artificial stones are identical in color, in composition, in cleavage, and in refracting power, as well as in density and fusibility, the only difference detected by the most careful tests consisting in the presence, in the artificial rubies, of minute bubbles of gas, sometimes elongated in parallel lines, and showing that the stones in which they are found have once existed in the form of a paste, probably by the melting together of their ingredients. Although such bubbles are never found in natural rubies, they are likely, through the reflecting surfaces which they present, rather to increase the brilliancy of the stones, and it must be regarded as certain that some one in or near Geneva, whence all the specimens are said to come, has discovered the means of making by artificial processes, out of cheap materials, jewels which sell readily at a very high price; a large ruby, as is well known, being worth more than a diamond of the same size. The French association of diamond merchants has, it is true, condemned the Geneva stones, pronouncing them not to be rubies; but if the inventor should be careful enough for the future in his processes to avoid the production of bubbles, which does not seem very difficult, there would be no means of distinguishing his product from the natural stones, and the decision of the association would have no effect whatever. As a manufacturer of artificial jewels would find it for his interest to scatter his goods as widely as possible, to prevent any particular market from becoming overstocked, to the detriment of the price, it is quite likely that some of the Geneva stones may have already reached this country, and the purchasers of precious objects of the kind would, perhaps, do well to investigate the subject.

EVERY one who remembers the Louvre and the Tuileries, as they appeared before 1871, and who has seen them since that time, must have been shocked at the change which has been wrought in that most august group of buildings. Our own earliest recollection of the place extends only to a remembrance of what it was about ten years ago, but even then the stately and silent courts of the Louvre gave us an impression of royal dignity, consorting very well with the melancholy grandeur of the ruin of the Tuileries, which stretched, in aristocratic reserve, across its vast garden. Within the last few years, however, all this has been changed. The middle portion of the Tuileries has been swept away, leaving only the two terminal pavilions, guarding, like two sentries, the yawning cavity which replaces the exquisitely sculptured detail of the old palace front. The garden, moreover, across which the ancient façade was seen, has been severed by a wide and busy street, the Rue des Tuileries, on which the Pavillon de Marsan and Pavillon de Flore now directly abut; while, as if to emphasize still more the secularization of the place, the Place du Carrousel has been enclosed by an ugly fence, and filled with sheds and stables for the occupation of the post-office delivery service. In its present condition, the appearance of the whole place would discredit a German village, and it is not surprising that the inhabitants of the most artistic city in the world cry out persistently, though in vain, against it. Many plans have been proposed for filling the void between the pavilions of the Tuileries, and thus completing in some way the façade on the new street, most of them having as a basis the very sensible idea of keeping the new constructions within the limits of a portico or colonnade, relieved in the central part by a larger mass, which could be utilized for a museum or public building of some sort. One of these projects had been so far studied that the central block was already appropriated for a Museum of the Revolution, and the scheme had found general approval when a concise note, as we learn from *La Semaine des Constructeurs*, made it known that the Government looked with an indifferent, if not an unfriendly eye, on the whole matter, and that it was very unlikely that the site of the palace would be surrendered for any such purpose. As the time had arrived for taking some definite steps toward commencing the work, if, as the patriotic citizens hoped, the museum was to be ready to add its attractions to the other incidents of the centennial celebration of 1889, the refusal of the Government to furnish its indispensable aid excited a good deal of indignation, and the municipality of Paris, which does not always submit very meekly to the wishes of the general Government, took up the affair with enthusiasm, and will, it is said, appeal directly to the Parliament of the Republic. In that body its wishes are likely to be heard at least with respectful attention, and it is to be hoped that means may be found for carrying them out. There is no period of history which more needs and deserves study than that of the French Revolution, and it is particularly important that the work of selecting and classifying data should begin now, while documents and objects of all kinds relating to it can be had in abundance, instead of waiting until the most valuable ones are lost beyond recovery.

MÜNTZ'S RAPHAEL.[1]—III.

In the beginning of Julius the Second's pontificate (1503–1513), there was a dearth of painters in the "Eternal City." Strictly speaking, there was no Roman school till Raphael formed one. The need of the moment was usually met by the importation of foreign artists. Renaissance Rome exploited Tuscan, Umbrian, or Venetian talent, as classic Rome utilized that of Greece. The Roman citizen, as in Virgil's time, willingly delegated to others the pacific glory of the arts. It was the decoration of the pontifical palace in 1507–1508 that drew to the banks of the Tiber the most accredited representatives of the Italian schools: Soddoma, Perugino, Pinturicchio, Signorelli, Lorenzo Lotto, etc., and that initiated the series of monumental decorative paintings which were to be the culmination, the last word, of Renaissance graphic art. Since the reign of Sixtus IV (1471–1484), there had not been at Rome so brilliant a concourse of painters; yet even these elect were forced to abdicate in Raphael's favor. It was, doubtless, owing to the influence of his compatriot, the omnipotent Bramante, that the young painter from Urbino was called to Rome, where he arrived in the month of September, 1508, at the latest. Apparently, he entered at once the service of the pope. The task that Julius II allotted him was by no means the least brilliant. To Bramante was apportioned the rebuilding of St. Peter's; to Michael Angelo, the never-to-be-completed mausoleum and the Sistine vault; to Raphael, the decoration of the apostolic palace.

The character of the impetuous Julius had no small influence on that of the contemporaneous arts, whose grandeur and elevation are, in a measure, attributable to the high ambitions of the warrior-pontiff. Giuliano della Rovere owed his fortune to his uncle's (Sixtus IV) elevation to the papacy. The young prelate was distinguished for his progressive spirit, love of truth, passion for the arts, and a violence that knew no bounds. Devoted and generous to those who shared his views, he was pitiless to his antagonists. Essentially a man of action, Julius did not hesitate to conclude the most compromising alliances, and, on the morrow, to break them. Neither did he shrink, in the days of stress, from ultra-Machiavelian methods. He even took under his wing the infamous Cæsar Borgia, against whom for ten years he had launched the hate of Europe. It was he, too, who decided Charles VIII to make his memorable expedition of 1494 into Italy, the source of endless miseries and complications, of which the effects are even now perceptible. But these contradictions should not blind us to his heroic traits — his indomitable energy, his disinterested efforts for the aggrandizement of the church, and the majesty of his conceptions. Whatever his faults may have been they were entirely free from littleness, from vulgar egotism. The protection he accorded the arts was dictated by a desire to utilize all the intellectual forces at his command for the glorification of the papacy. Hence, the character of grandeur that pervades all his creations, and which contrasts so sharply with the mild elegancies of Leo X's reign. Unlike the latter he had but little taste for literature. He doled out to it encouragements that were lavished on painting, sculpture, and architecture. Artists knew that they could count on his favor provided they were distinguished by some transcendent quality. At his court there was no place for mediocrity. Is it to be marvelled that he cherished Michael Angelo, in so many ways a kindred soul? It may be doubted whether Julius ever had the personal tastes of a Leo X, or well-defined views on art, or a self-formulated code of æsthetics. However this may be, his inspirations were true, and he chose as wisely as relentlessly, remorselessly sacrificing the heroes of yesterday to the celebrities of to-day; Perugino, Soddoma, Signorelli, Pinturicchio, to the rising star from Urbino. Frugal in his habits, and little prone to display, it is not to be wondered that the secondary, or sumptuary arts — embroidery, tapestry, jewelry, and the like — so liberally patronized by his predecessors and so generally encouraged by his successor, languished during his reign. He favored almost exclusively the monumental arts — painting, sculpture and architecture.

The *entourage* of Julius's court was so brilliant, and its enlightening influence so directly manifest in Raphael's work, that it warrants a brief mention of a few celebrities. The College of Cardinals included, among more modest patrons, three great Maecenases — the magnificent Riario, with his escort of four hundred mounted men; the Venetian Grimani, whose superb collections and almost unrivalled library were the admiration of Rome, and subsequently the pride of Venice; and lastly, Giovanni de' Medici, the future Leo X, enthusiastic in his cult of literature and the arts. Besides the sacred college, the so-called *Curia* helped to make the papal court the brightest, the most cultivated and artistic in the world. It was represented by such men as Bibbiena, Bembo, Inghirami, Goritz, Turini; the first two cardinals in embryo, and all intimate friends of Raphael. Bibbiena, diplomatist and man of letters, had a fine appreciation of the arts. He was author of the *Calandra*, said to be the first prose piece of the Italian stage. Nor did this prince of the church occasionally scorn to assume the functions of *impresario* at the pontifical entertainments. Bembo was one of the first *littérateurs* of the Renaissance. His exquisite taste and patronage of the arts were entirely free from vulgar love of display. He formed, at no great personal sacrifice, a collection of marbles, bronzes, gems and medals that was reputed at the time one of the rarest in Italy. Among his pictures were works by Memling, Mantegna, Giovanni Bellini, S. del Piombo and Raphael. Having summed up the brilliant qualities of Inghirami, M. Müntz observes, "What would remain of him to-day had not Raphael immortalized his features in the admirable portrait of the Pitti palace." First among the laymen who frequented the court must be mentioned Raphael's friend of Urbino-days, the all-accomplished Count Baldassare Castiglione, author of the *Cortegiano*, and many exquisite verses, who seems to have been the "perfect gentlemen" of the time. His influence on the young painter was most beneficent, and his advice during the execution of an historical painting equally invaluable. Both the famous Ariosto and the infamous Aretino were known to Raphael. Aretino claimed to be intimate with him; while it appears from a letter, of which the original is unfortunately lost, that Ariosto, then an envoy to the court of Julius from Alfonso of Ferrara, was consulted by Raphael as to choice of personages for the "Disputa." Then, too, there was the great Sienese Crœsus, Agostino Chigi "the Magnificent," with his hundred ships, and as many counting-houses — not in Christian Europe alone, but in Constantinople, in Alexandria, in Memphis, — with his twenty thousand employés; his princely income, and his princely manner of spending it. It is to him that we are indebted for the Farnesina palace and the chapel in S. Maria del Popolo. The artistic band was recruited from all Italy, and above the rank and file towered such giants as Michael Angelo, Bramante and Raphael. Yet not even these great names can obfuscate those of the San Gallo, the Sansovino, and Baldassare Peruzzi, not to mention lesser lights. Thus in the court which surrounded Julius, says M. Müntz, "there was no merit or virtue that was not brilliantly represented: science, talent, nobility and courage, distinction of taste and liberality, qualities of the heart and qualities of the mind, all attained there a degree of splendor that is the despair of posterity, and which was only matched by the enormity of the vices of that pre-eminently ardent and wavering epoch. An equal magnificence may have been seen in other times; but never such a love of intellectual delights. All these painters of fortune — and why not pronounce the word? — all these *parvenus* who constituted the most interesting element of the pontifical court, sought to legitimize their power or their riches by a cultivation of the beautiful; they thus hoped to approach nearer to the ancient Romans, of whom the imitation was, in their eyes, the end supreme." In no other court than that of Rome, a republican despotism — if the paradox may be pardoned — was such a society possible.

Raphael's first work in Rome was the decoration of the *stanza*, called *della Segnatura*. For this he received 1,200 golden ducats, equivalent in the money-power of to-day to about $12,000. The hall was completed in 1511, after three years' labor, not, however, without the interruptions caused by his synchronous easel-pictures in oil, his innumerable designs, architectural studies, etc. Taken as a whole, this *stanza* is the most completely representative of Raphael's development, if not of his talent. In the subsequent *stanze* there may be a distinct advance; in them he is more dramatic and powerful; the flower of his genius has expanded to the full extent of its shapely petals, but for that very reason it is a little nearer its decay, and has lost the ineffable charm and freshness of its blossom-state, we admire isolated figures here and there, we feel that there never were nor ever will be such groups as the wingless young men "excellent in beauty and comely in apparel" fleeting the marble pavement with scourges raised, the fallen Heliodorus, and the horse with the "terrible rider;" or such a figure as the female water-carrier in the "Incendio del Borgo"; or a composition admirable in so many respects as the "Miracle of Bolsena"; yet, as a whole, no *stanza* is more satisfactory than that of the *Segnatura*. In none other did Raphael do so much personal work. In each succeeding *stanza* he worked less and less, owing to his multifarious cares and duties, till at last his actual participation was confined to the preparatory sketches and general direction. In the frescos of the *Segnatura* there is a symmetry, sobriety and purity, the result of a cultivated mind, seeking and pains-taking, well-equipped and capable of expressing itself, but not yet hurried and over-confident. To see how seeking and pains-taking Raphael was at this time, one has only to look at his many tentative schemes for the "Disputa," all so different from the final work. There is a vast chasm between his first Roman fresco and all that had gone before, both as to epic expression and power of composition, as well as individual characterization. Yet every now and then one feels a whiff of the delicious sentiment that emanates from his Florentine madonnas, a sentiment that is scarcely discernible in his later work, save where it occasionally reveals itself, as in the "Madonna del Foligno," or the group of "San Sisto." To be accurate, the "Madonna del Foligno" cannot be classed among his later works, for it was painted in 1511, but it is later by two years than the "Disputa."

At the outset, Raphael had to contend with the technical difficulties of fresco, which are not inconsiderable. He had already acquired some valuable experience while working under Perugino on the frescos of the Cambio, and again at San Severo in 1505, after a long lapse

[1] "*Raphael, sa vie, son œuvre, et son temps*," par Eugène Müntz, Paris. Librarie Hachette & Cie., 1886. Continued from page 148, No. 561.

of time devoted to easel-pictures in oil. If the "Disputa" testifies to a certain inexperience, the "School of Athens" evinces a prodigious surety of handling, that entitles Raphael to be ranked among the first frescoists of all times. A careful examination of the *stanze* frescos by M. Raymond Balze, authorized him to state that the group at the left in the "Incendio del Borgo," composed of four figures larger than life, was painted in six days. In the "School of Athens" "each figure scarcely exceeded a day's work." This of course did not include any retouching "*a secco*," nor the longer time occupied by the cartoon and preparatory studies.

The immense progress made by Raphael after his arrival in Rome must be mainly attributed to his contact with the antique. Such *chefs-d'œuvre* as the Laocoon, the Apollo Belvedere, the Torso, the Ariadne, had already been discovered. The Museum of the Capitol, founded as early as the reign of Sixtus IV, was rich in marbles and bronzes, while the private collections contained priceless antiques. "There was scarcely a prelate, diplomatist, grand seignior, or banker, who did not ardently search for everything which recalled the ancient splendor of Rome: statues, bas-reliefs, gems, medals, and even inscriptions." Then there were the frescos in the Baths of Titus, and the Gardens of Sallust; the triumphal arches of Titus, Septimius Severus, etc.; the columns of Trajan and Antonine; the colossi of Monte Cavallo, and an inexhaustible mine of classical relics, abounding in suggestions. The passion for antiquity was in the air. When to his functions of painter, Raphael added those of archæologist he sent his draughtsmen all over Italy, and even into Greece. This inordinate love for the antique eventually interfered with the personal spontaneity of production, and became an end rather than a means. Raphael had not been insensible to antiquity before his advent to Rome; but like the men of the first Renaissance he translated it into the Umbrian or Florentine vernacular, retaining, perhaps comprehending, but little of the antique feeling. At Rome, the imitation was to be far more direct. There is not much of it in the "Disputa," which still retains the Umbrian-Florentine flavor, though even here it crops out in the chair of St. Gregory. It is very patent, on the contrary, in the "School of Athens" and "Parnassus," which indicate a decided advance on the "Disputa." This advance can in nowise be attributed to the influence of Michael Angelo, for the first half of the Sistine vault was not exhibited — and then to the great disgust of the artist — till 1511[1] the year in which the *stanza* of the *Segnatura* was completed. At once the receptive Raphael executed the "Isaiah" in the Church of S. Agostino, which was directly inspired by the great Florentine (who was very wroth thereat), as were the "Sibyls" in the Pace, painted in 1514. The subjects that cover the walls and ceiling of the *Segnatura* or "Chamber of Faculties," are most ingeniously conceived and correlated; an interlacement, as it were, of Christian and Pagan myths, of ancient and ecclesiastical philosophies, and the personification of virtues common to both. The literary attainments of Raphael would not have enabled him to expound this complex scheme had he been unable to take counsel with the distinguished men of letters that frequented the court, and with whom he was on intimate terms. Moreover, the personal influence of the pontiff must count for much in the choice, arrangement, and elucidation of the subjects. "The artists of the Renaissance were accustomed to receive from their patrons the indication, generally very precise, of the subjects they were commissioned to represent. Michael Angelo was one of the very few masters who worked out for themselves a scheme for their compositions. It is true that Michael Angelo could pass for a man of letters, but even if he had not surpassed the majority of his contemporaries in this respect, the knowledge of the Old Testament, whence he drew his inspirations, did not exact so special an erudition as the subjects with which Raphael was charged to decorate the hall of the *Segnatura*." It must not be supposed that Raphael was a mere passive instrument in the hands of the savants, for he was well instructed, and thoroughly conversant with the tangible expression of antiquity, and his artist's perception revealed to him many secrets forever hidden to the antiquary; yet it would have been impossible for any painter, certainly of his years and occupations, to be familiar with historical and ecclesiastical history, or with matters of historical detail known only to specialists. It is very much to his credit that he was able to digest these complex ideas, to see them beautifully, and to present them monumentally. These stately, well-balanced compositions are remarkably free from pedantry. In the "School of Athens," he never abrogated his rights as an artist, though depicting definite, historical men and ideas. The noble picture is wholly untainted by archæology, being an epic in itself, not the mere archæological rendering of an epic. In a word, it is no *genre* picture as it might easily have been in less skilful hands, and probably would be if painted by a modern man. Art and archæology can never be identical. The history and myths of antiquity are to us an ideal world, peopled with beautiful, heroic beings. Render them literally, and our fairest creations vanish forever.

It is almost amusing to discover ever and anon in these frescos the prototypes of so many of those stilted academic figures that at one time made art hideous. But the cartoons for the tapestries furnish a far larger quota, and possibly for this reason they are to me less sympathetic. It is a very dangerous thing, be it observed parenthetically, to draw inspiration from a well-ripened art.

Julius died, and Leo X succeeded him in 1513, when the *stanza of Heliodorus* was a little more than half completed. The elevation of Giovanni de' Medici to the papacy opened new fields for the play of Raphael's versatile talents, and was a turning point in his Roman career. Under the grandeur-loving Julius, his powers were concentrated; he was a monumental painter. Under the sumptuous Leo they were scattered. By turns he was painter, architect, archæologist, designer and even sculptor. Leo was as suave and luxurious, as Julius was austere and economical. [The latter's favorite sculptor was in Leo's eyes "*terribile*."] His taste for literature and the arts has already been noted; to which must be added a joyous temperament, a love of pomp and mental pastimes, combined with a prodigality that at times severely strained his exchequer. Never had Italy witnessed so intellectual an epicureanism. Not only the arts and letters, but the sciences music and the drama as well were welcome at the court of Leo, who, however was not oblivious of the Church's interest. To meet the demands made upon it by such a pontiff, it can readily be imagined that the strength of the complaisant and gifted Raphael was sorely taxed. At one time there were cartoons for tapestries to be furnished; at another a scene to be painted; now a platter to be designed, or a defunct elephant to be portrayed the size of life! The great painter's head and hands were at the service of all the decorative arts, — mosaic, wood-carving, gold and silver work, textile fabrics, intarsia, pottery, etc. "If to the models composed for these different industries are added the numberless motives for ornament contained in his frescos and pictures, it will at once be perceived that Raphael occupies a position quite as important in the annals of decorative art as he does in those of painting properly so called."

In the *stanza* of *Heliodorus*, for the first time, Raphael entrusted a considerable portion of the work to a collaborator, Giulio Romano. After the accession of Leo his personal work on the wall was greatly curtailed, and much was delegated to Giulio, to Penni, Perino del Vaga, Giovanni da Udine, and the leaders of the artistic band that the fame of Raphael had recruited from all parts of Italy, and even beyond the mountains. The organization of his atelier was on a vast scale. Were colors wanted, a pupil was despatched to Venice to procure them; another was sent with the "cartoons" to Brussels in order to superintend the weaving of the tapestries; and others, as before noted, to draw in Southern Italy and Greece. The master went abroad with an escort of fifty young painters, a veritable prince of the brush. The frequent abdication of his personal work in favor of his pupils will account for the many strange inequalities to be found in his later paintings, both mural and easel. By the side of his maturest figures and appropriate coloring, are to be recognized the inferior drawing and heavy tones of his disciples. It is impossible to state just how much the hurry of the last few years compelled the reluctant master to leave to his collaborators, but doubtless very much more than is commonly supposed.

Would that I might quote in its entirety Taine's inspired chapter on Raphael in his "*Voyage en Italie*," [T. 1, p. 215], but I must limit my citations to a few disjointed sentences. Referring to the *stanze* he says, "Surely nineteen sight-seers out of twenty are disappointed, and stand with mouths open, muttering, 'Is that all?' It is with these frescos as with the mutilated texts of Sophocles or Homer. Give a manuscript of the thirteenth century to an ordinary reader, and take it for granted that he can decipher it. If he acts in good faith, he will in no wise understand your admiration. I, too, understand that I do not understand. It will take two or three visits to make the necessary abstractions and restorations. In the mean time I am going to say what shocks me: that is, all these personages *pose*." Of the "Transfiguration" he asks, "Has Raphael any faith in his miracle? Above all, he believes that he must choose and arrange his attitudes. The beautiful young woman on her knees is thinking of an effective position for her arms; the three rising muscles on her left arm make an agreeable sequence. . . . Moses and Elias in glory on either side of Christ are swimmers who display their limbs. The Christ himself, with his feet so clearly indicated, his toes separated, is only a beautiful figure; his ankles and insteps have preoccupied him as much as his divinity. This is not impotence, but system, or rather instinct, for there was no system." Again, of the "Incendio del Borgo": "Paltry conflagration and so little to be feared! The fire does not burn; how could it when there is no wood to be consumed. The principal personage is a well-fed young man, hanging by his arms, who finds time to try gymnastics. . . . Two women carry vases and shriek; the caryatides of a Greek temple would have the same movement. I only see there painted bas-reliefs, a complement of the architecture. One goes away with this idea and ponders. To enter into the ideas of a painter one must look at things from his standpoint. And certainly this was Raphael's standpoint. These paintings are not attached to the wall; they are a part of it. They clothe it as the skin clothes the body. . . . The whole Italian painting turns on this idea: it has rediscovered the nude figure. . . . This culture [of the human form and its action] so concentrated will unite all Raphael's faculties on a single point; all the vague aspirations, all the touching or sublime reveries that occupy the leisure hours of a man of genius will end in outlines and movements; *he will think in forms as we think in phrases*." . . . From this point of view, "all his figures are eloquent. They are

[1] C. H. Wilson holds that the first part of the Sistine frescos were exhibited November 1, 1509. In that case Raphael would have seen them about a year after the commencement of the *stanza della Segnatura*. In the "School of Athens," the second of the two great compositions in point of time, one discovers marked traces of Michael Angelo's influence; but these may well have been reminiscences of the Pisa cartoon, or other works that were doubtless to be seen without much difficulty. M. Müntz adduces strong authority for delaying the first exhibition of the Sistine till 1511.

emancipated from the laws of nature; they have never suffered; they cannot be discomposed; their calm attitudes are those of statues. Raphael has given them his soul. . . . Human life is infinite and immensely diversified; but there are only certain portions, certain instants, which, like a rose among a hundred thousand roses, deserve to live, and such are these attitudes." How this brilliant exegesis contrasts with the indiscriminating comments of Vasari, who never seems to have divined the controlling idea of production, but is ever harping on certain superficial characteristics, and these the least remarkable, if remarkable at all. To praise the realistic qualities of the great Italian paintings is to pay them the sorriest compliment.

Reference has already been made in the second paper of this series [Vol. XX, No. 561] to Raphael's preparatory life-drawings and studies. At first he seems to have preferred the silver-point and pen as a means of expression, but after his arrival in Rome, sanguine, and occasionally Italian stone, for isolated figures, reserving the brush for compositions. Though he constantly fortified himself with studies from nature, his drawings were always treated subjectively, and carried just far enough to meet the temporary want. The professional model, fortunately, had not yet been evolved. His preliminary studies for the "Holy Family of Francis I" are most instructive and significant. Let us fancy ourselves, says Charles Blanc, in the atelier of the master. "A young Trasteverina has been led there to serve as a model for Raphael, who is contemplating the Holy Family, now so famous, which we own in the Louvre, 'the Madonna of Francis I.' Clad in a simple tunic, her hair negligently arranged, the young woman, with knee bent and bare leg, inclines forward to lift a child that as yet exists only in the artist's intention. In this attitude she poses before the eyes of Raphael, who, desiring truth before beauty, notes the movement of the figure, makes sure of the proportions, seizes the play of the muscles, and verifies the grace of his thought. But this is only a third of the story. The same young woman will pose again, this time entirely clad and draped, with the exception of the left arm, which will remain bare and afterwards be drawn separately, covered with a sleeve. . . . And yet he knew them by heart, these madonnas with their infant Jesus." There is every reason to believe that Raphael's unrivalled children were the offspring of his imagination. Surely their graceful movements and infantile charm were suggested by domestic scenes, but the forms are distinctly creative. Now that we are on the subject of preliminary studies, it may be said that all the painters of that epoch, who drew figures in positions impossible for a model to hold, made more or less use of models in wax and other mechanical contrivances. According to Lomazzo, Bramante discovered certain *quadrature* of the human body and the horse, "a rare and wonderful invention" by means of which models could easily be fashioned. "These were afterwards given by him to his relative, Raphael of Urbino."[1] It is very strange that there are so few of the master's color-sketches extant. M. Müntz mentions none, nor have I any personal recollection of them. He probably relied almost entirely on his mental vision for guidance. It is scarcely necessary to add that he did not paint directly from living models, either on wall, panel or canvas.

Raphael was cut off so early in his career of architect, that it is difficult accurately to guage his powers. Nevertheless he holds an honorable place in the annals of architecture, though not rising to the height of a Brunelleschi, Alberti, Bramante, or Palladio. "He has the right," says M. Müntz, "to take his place among the masters of the art of building, not only on account of the importance of the works he directed—the continuation of St. Peter's, the completion of the Loggie, the construction of the Villa Madama, and so many others, but also on account of the superior taste he showed in these enterprises. The architect, it is true, was developed later in him than the painter. But towards the close of his life, to gain lost time, as it were, Raphael did not hesitate to sacrifice painting to his new studies." His early penchant and talent for architecture are revealed in the charming backgrounds and accessories of his Umbrian pictures. At Florence these tastes remained in abeyance, but once in Rome, his intimacy with the great Bramante immediately gave them a fresh impulse. It was Bramante, by the way, who designed the beautiful architecture in the "School of Athens." So readily did the pupil profit by the master's lessons, that Bramante designated him as his successor [died 11 March, 1514]. "Seeing," runs the brief of Leo, "that you not only excel in the art of painting by universal consent, but that you have been designated by the dying Bramante as sufficiently skilful in the art of architecture to continue the construction of the temple of the prince of the apostles commenced by him . . ." Then it was that he devoted himself to a profound study of Vitruvius. One cannot but regret Raphael's participation in the building of St. Peter's. According to the testimony of a contemporary, from the day that he succeeded Bramante, "he experienced the effects of a sort of melancholy." Nor were the results proportionate to his efforts. Many years were required to consolidate the edifice, and then the funds failed. Of his secular and private buildings, the Villa Madama, on Monte Mario, and the Palazzo Pandolfino at Florence are generally esteemed his *chefs-d'œuvre*, and are deservedly ranked among the most beautiful buildings of the Renaissance.

Raphael owes his exalted position in the hierarchy of art, partly to natural gifts and partly to the fortuitous conditions of time, place and emergency. Alas, how many god-gifted souls, never quickened by these conditions, forever sleep! Slow to develop, his natural gifts were supplemented by close application. "From my earliest childhood," he said, "I have made it a rule to neglect nothing." [Passavant, vi, p. 246.] Decadence set in when his pupils substituted formulas for an ardent initiative. At Perugia he acquired warmth of coloring and intensity of religious sentiment; at Florence, greater technical skill; at Rome "he felt the force and joy of paganism." He was fortunate in that he was rarely crossed, and never pinched. Work of the most inspiring kind, that would have elevated even a mediocre artist, came to him fully equipped when he needed the stimulus of responsibility and the exercise of his faculties, which would otherwise have perished from inanition. It came, too, when art was at its zenith; when, after centuries of husbanding, the fruit was ripe. Raphael was not an isolated figure like Michael Angelo — who was as isolated as a man can be — but a *résumé* of all that was and had been. Pages might be devoted to his personal characteristics — to his courtesy, his amiability, his tranquility of soul in an age rife with passion and violence; for heaven, says the Italian biographer, had accumulated on him all her blessings. Yet there is one trait that must be especially emphasized, the key-note of his inspiration, and that is his love of beauty. For an eloquent and pathetic tribute to his character and talents I must refer the reader to Vasari's eloquent peroration: "*O felice e beata anima. . . .*"

M. Müntz is certainly to be congratulated on his scholarly, well-ordered and thoroughly readable book. It is a cyclopædia of Raphaelesque knowledge, pleasantly free from sterile disputations and a vain show of erudition. If there is anything to be criticised, it is the picturesque enthusiasm of the biographer for his hero, that, in the absence of authority, at times leads him to assume too much. For instance, his theory (based merely on the accidents of pose and technique) that Raphael, when portrayed by Marco Antonio (p. 659) was experiencing the symptoms of his fatal malady appears to me very fantastic. As to the cause of Raphael's death, neither Passavant nor M. Müntz adduce convincing reasons for discrediting Vasari, whose version is not irreconcilable with the contemporary letters of Michiel, Mirandola, or the envoy from Ferrara. But this is a mere matter of detail, and a very questionable one. It would seem ungracious to find the least fault with a work so monumental — a generous and worthy tribute to the memory of the great painter.

Frederic Crowninshield.

[1] *Idea del Tempio della Pittura*, ed. of 1785, p. 14 (original ed. 1571).

BIRMINGHAM TRADES EXHIBITION.

In connection with the British Association visit to the midland capital of England, an exhibition was arranged in Bingley Hall to illustrate the industrial resources of the workshop of the world, admission being restricted to a radius of fifteen miles from the town-hall. Notwithstanding the limited area, the products of no less than two hundred and fifty distinct trades, special to Birmingham, may be counted.

By the present imposing display, the town has fully redeemed its character for turning out "Brummagem" ware, and it has proved that good and conscientious work may be produced provided a fair price be obtained. The exhibition has come quite as a surprise on account of its richness and variety, while the popularity it at once secured was also unexpected, so much so that the doors will, at any rate, not be closed before the end of October.

To lend additional interest the archæological section of the Birmingham and Midland Institute has contributed a series of sketches and photographs of old streets and buildings in Birmingham, most of which have now been removed. Moreover, on the north and west sides of Bingley Hall, where the exhibition is held, are reproductions of old Birmingham houses, designed by Mr. J. A. Cossins, and erected by Mr. G. H. Bernasconi. They include the interior of an alchemist's laboratory, with all the traditional accessories, and tenanted for the nonce by a well-known Birmingham man, dressed in antiquated garbs, whose keeping-up of the character caused no little interest during the conversazione in connection with the British Association Meeting. A series of helmets, some of them fearfully and wonderfully made, worn by the Birmingham Fire-Brigade since it was first established in 1710, excite the wonder of beholders. A collection has also been got together of old books printed in Birmingham between the years 1757 and 1873, with type and matrices for the University Press at Oxford.

One room is set apart for all the drawings that could be collected actually made by James Watt, the inventor of the steam-engine, who lived and worked at Handsworth, near Birmingham, where the works started by him are now carried on by Boulton & Watt. Some of the old handicrafts of the district, now fast dying out before the march of improvement and machinery, are practically represented. There is the gold-beater laboriously hammering out between skins his fine

film of gold, ever and anon changing his double-headed hammer from one hand to the other; but he will not be disestablished just yet, for no mechanical process has been found to give the same result as his dull "thud, thud, thud," upon the yellow metal. A man, woman and boy are making nails by hammer on small anvils supported on barrels. They take two slit rods from the fire at once and forge them at the same time, giving a blow alternately to each. Their hard labor from early morn to dewy eve barely suffices to keep body and soul together; and this is easily explained by the large and varied collection of machine-made nails sent by Felix Hadley, whose automatic machines, six of which are tended at once by an unskilled hand, produce an almost incredible number from the strip of sheet-iron. The trophy of Nettlefolds — name almost synonymous with screws — shows, too, the great variety of similar articles that can be turned out by millions in the machine. The file-cutter is producing, before the eyes of visitors, the furrows in his steel bar laid on a leaden bed, with broad chisel and mallet. But, though the cuts are remarkably regular while they succeed one another, there is a manifest break of continuity when he lifts his hand to shift the steel. He, too, will soon find his occupation gone, except for special forms, in presence of the machine-made article, now nearly, if not quite, as good as that produced by hand.

Bell-founding is illustrated by the formation of the mould in sand from the pattern. The spurrier, an old Birmingham handicraftsman, who of yore had his guild, is still forging spurs for the lieges. While an ingeniously elaborate machine weaves wire-gauze for safety-lamps, etc., wires are, strangely enough, being woven by a girl's hand into fire-guards. The old style of weaving by the hand-loom is shown, side by side with the new, and the Steven-graph ribbons that were invented by a philanthropist, possibly injudicious, to prolong the dying trade of the Coventry ribbon-weaver, grow in the special loom with more or less artistic representations of persons and things. A practical illustration is given of hand brush-making, the principal difficulty of which appears to be judging the exact quantity of hair, bass, or bristle for filling the hole in which it is fastened by pitch. A resource for the blind is found in chair-caning and mat-making, in which they soon become very expert.

Specimens of the Staffordshire blue bricks, and of the famous Stourbridge fire-bricks, are on view in various stages of manufacture, with the respective clays from which they are made. Hopkinson & Co. show varieties of their revolving partitions, which have been adopted by the Birmingham School Board. They consist of red deal slats, strung on copper bands, like revolving shutters, and rolled up into a box under the ceiling, while the grooved uprights may be removed with little difficulty. The object is to readily convert a large school into class-rooms when required; and it is said that these movable partitions cost less than fixed wooden partitions. John Parker sends from his steam joinery works a fifteen-inch pitch-pine log, with fluted sides and the top handsomely moulded, to show what large stuff may be dealt with by modern wood-working machinery. He also exhibits the lower portion of a pitch-pine staircase, with ornamented newel and moulded handrail in walnut, square-turned and fluted balusters, string with solid sunk panels, and spandrel and dado panelling to match, all done by machinery, hand-labor being reduced to putting the stairs together. Henry Hope sends ornamental wrought-iron casements — a specialty.

Jones & Willis, who make the 50-candle "Hesperus" lamp to burn petroleum, with three wicks arranged in the form a triangle, have an attractive stand of art metal work, woodwork, embroidery and textile fabrics, as used in the service of the Church of England. Hart, Son, Peard & Co. show a replica (not, however, so elaborately chased) of the "angel" lectern they made for the Philadelphia cathedral. Though eagle lecterns are common, it appears that only these two "angel" lecterns exist. This firm has brought out a perfectly original and exquisitely beautiful vase that will not break: the foundation is of sheet-copper, polished and left its natural color, when it soon assumes various hues from oxidation by the air. The ornaments are sprays, beaten out by the hammer from black iron, copied from the hop, ivy, etc., no two being alike.

There are two exhibitors of high-art furniture: Chamberlain, King & Jones have a richly carved Renaissance sideboard and chairs in pollard oak, the dead ornament showing in fine contrast with the polished moulding, and also an example of pure Adams style in an inlaid rosewood cabinet, settee and writing-table. Morris and Norton have put up a pavilion, with dining-room furniture in pollard oak, drawing-room ditto in rosewood, inlaid with various woods — the finest work of the kind executed in Birmingham — and two bedroom suites, one in rosewood and the other painted white.

Tonks & Sons, whose name is identified with improved house-fittings, not unknown in the States, have a whole exhibition to themselves; and it is difficult to do them justice in a few lines. They have on view Carroll's ventilators, which admit the outer air through an adjustable aperture in the bottom rail of a door, giving it a vertical direction for avoiding draughts. They have a handy means of raising and lowering a heavy upper sash with next to no effort. Their metallic sash-cord wears well without wearing out, avoiding the nuisance of a broken cord and fallen counter-weight. Their blind furniture makes a blind stop where it is put. Their patent bolt seems to go into its socket all by itself, avoiding the necessity for that humoring which is so annoying when one is in a hurry. Their door furniture is simple and effective, so simple that the chances are remote of its getting out of order. For unsound plaster walls, they have a neat escutcheon, fixed by three small pins, and carrying a curved socket, through which picture-cord is passed, the friction facilitating the adjustment of the picture, and preventing its being placed awry accidentally. Their iron book-shelf strips, to receive the shelves at heights varying by about an inch, must save a great deal of time and expense in fitting wood strips for a similar purpose.

A variety of household requisites stamped out of sheet-iron and tin plate are shown by J. H. Hopkins & Sons, who finish them with their new "stannic enamel," which gives them a semi-matt morocco leather appearance, well suited to the present taste. The articles are painted over with the specially prepared enamel, then rolled while still wet, by a roller coated with some glutinous composition, something like those used for applying printers' ink to the types; but in parts where the roller cannot reach, the enamel is dabbed with a dabber. This produces a uniformly granular surface, very pleasing when in semi-tones relieved by gold ornament; and it is fixed by baking the articles in a stove like that for japanning. British Association visitors saw the operation in progress at Messrs. Hopkins's works.

The centre of the exhibition is occupied by a light-house, with revolving, dioptric lenses, specially arranged for the electric arc, erected by Chance Bros. & Co. It flashes every ten seconds, making a complete revolution in two minutes, and having shades of red and green to vary the effect. Mr. and Mrs. Goold, of Milverton House, Knowle, contribute a "regulator clock of many nations," supposed to be without its fellow in the world. There are twelve dials working from one central movement, surrounding a large one which gives Greenwich time, and also a seconds' dial and a solar dial, the latter revolving while the pointer is stationary. The hours of New York, Paris, Sydney, Madras, Calcutta, Canton, St. Petersburg and Constantinople are shown simultaneously. The escapement is "Graham's dead beat," with no recoil, invented one hundred years ago, but not yet superseded. T. Wilkinson & Sons show something new and agreeable in Perry's sweet resonating gong, which consists of a hollow circular metal vessel, with lipped mouth, generally resembling a gong, and hung freely: when struck in the ordinary way, it gives out a melodious sound, varying in tone with the note to which it is tuned. Several of them are hung together in a frame, to form a gong-chord, and competent musicians are of opinion that this will form a valuable addition to an orchestra.

What must come as a boon and a blessing to women is a sewing-machine motor, devised by W. Bown, the inventor of ball bearings for tricycles. Two minutes' not laborious winding-up of a spring will keep the machine going for an hour, while the speed may be regulated at will. A. Shirlaw & Co. show, running, Spiel's petroleum engine, which draws its supply from a tank by a centrifugal pump, thus obviating any handling of the oil, and utilizes it in a fluid state, at about a pint per horse-power per hour. The engine may be started at any moment, and comes to rest when the supply is exhausted, requiring no attention. Tangyes, limited, exhibit in action their gas — not steam — hammer, giving 2,500 blows of 3 cwt. through one foot, for the small charge of one penny.

Muntz Metal Company show a 1,000 foot coil of small copper pipe, without seam, drawn perfectly parallel from end to end by Sharp's patent process. The processes of steel-pen making are illustrated by Perry & Co., who have also brought out Appleby's new drive-chain. This consists of square links, connected by v-shaped links in such a way that each link is readily detachable, and yet is held firmly and with great side support, to prevent stretching. S. Alcock & Co., who have a branch establishment at Toronto, show a great variety of fishing-tackle, the best rods being now built up with six segments of the same or different woods, so as to secure straightness of grain. Henry Milward & Sons, the largest needle-makers in the world, whose works at Redditch were visited by members of the British Association, show a great variety of this universal tool, which passes through at least twenty-six distinct processes, notwithstanding the introduction of much automatic machinery to facilitate the operations.

J. W. P.

THE ILLUSTRATIONS

Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

THE ROTCH TRAVELLING SCHOLARSHIP DRAWINGS. — PLATES XXVIII, XXIX, XXX.

[Issued only with the Imperial edition.]

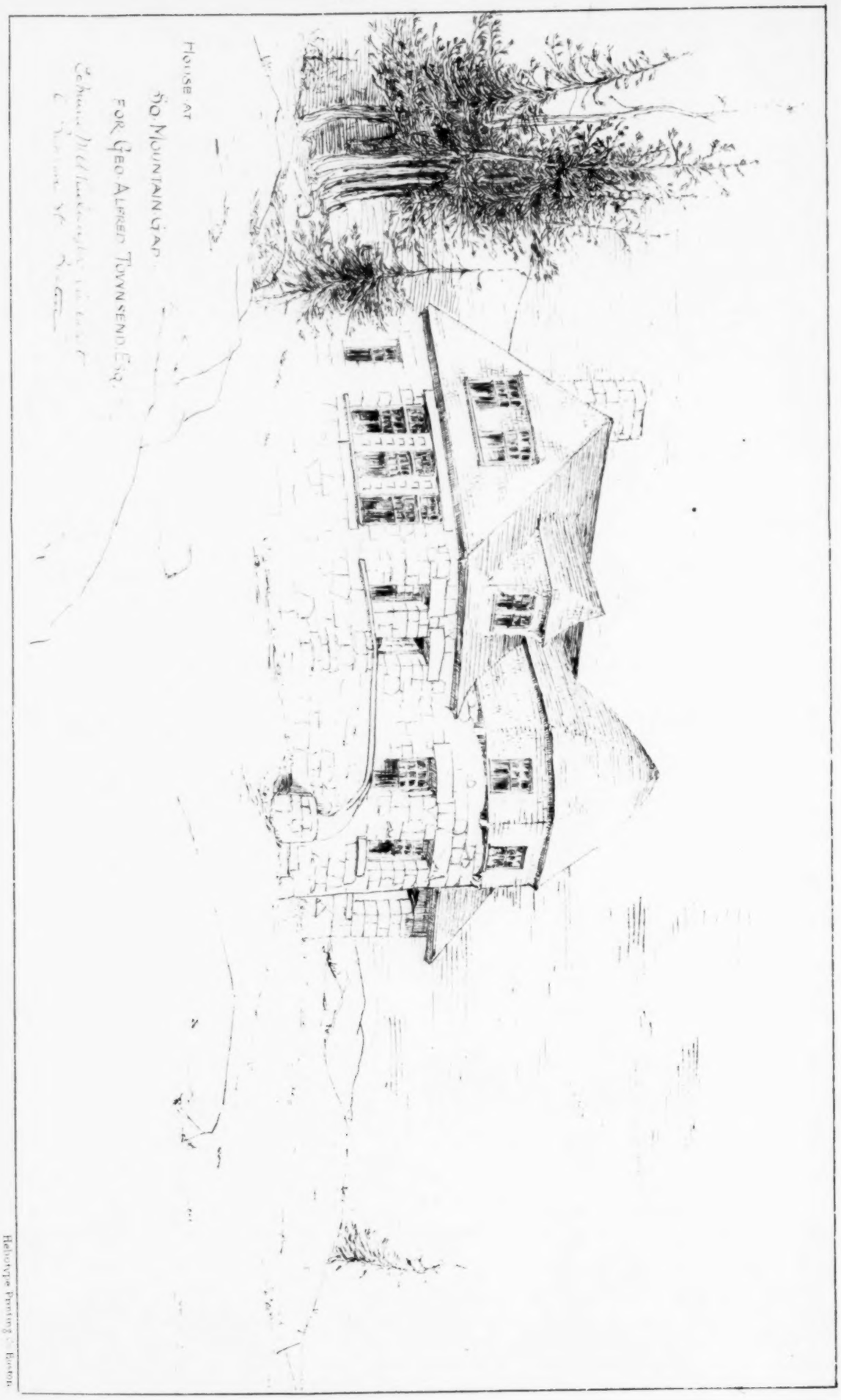
BUILDING FOR MESSRS. EIMER & AMEND, NEW YORK, N. Y. MESSRS. DE LEMOS & CORDES, ARCHITECTS, NEW YORK, N. Y.

This structure is intended to be fire-proof throughout. The interior of walls of first and second stories is lined with white enamelled tile. Cost of building, including store fittings, $120,000.

CHAPEL FOR HOLYHOOD CEMETERY, BOSTON, MASS. MR. T. O'GRADY, ARCHITECT, BOSTON, MASS.

HOUSE AT FALMOUTH, MASS., DESIGNED FOR HIMSELF, BY MR. FRANK HILL SMITH, ARTIST, BOSTON, MASS.

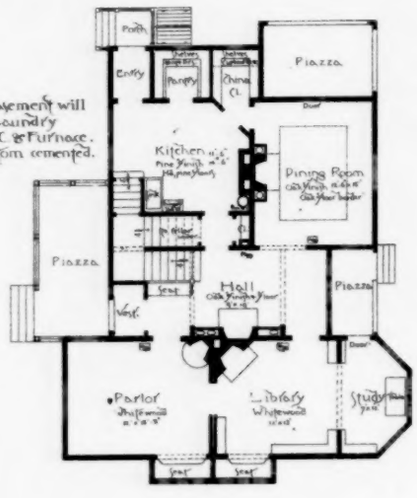
COPYRIGHTED 1886 TICKNOR & CO.



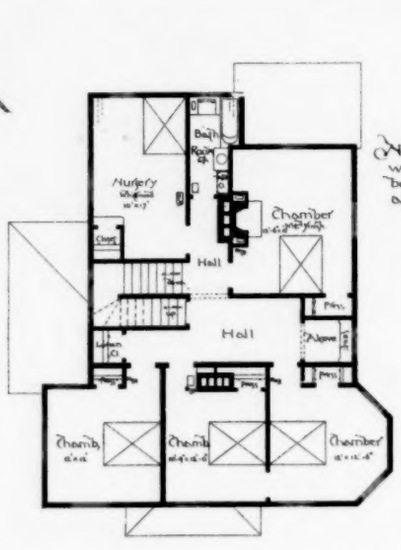
Heliotype Printing Co. Boston.

COPYRIGHTED, 1886, TICKNOR & CO.

Note. The Basement will contain Laundry Veg. Cellar, W.C. & Furnace. Cellar bottom cemented.



FIRST FLOOR PLAN



SECOND FLOOR PLAN

Note. The Attic Story will contain Two Chambers and Hall finished also Play Room unfinished

Scale ⅛" Plans & Elevation.

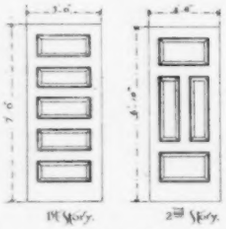
American Architect Competitions

$5,000—HOUSE,

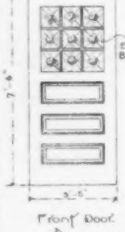
by

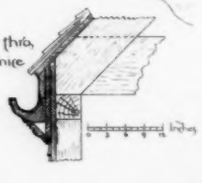
"The Two Dromios."

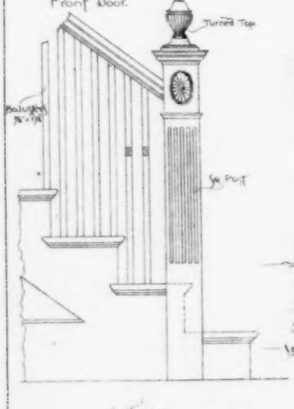
Perspective View.



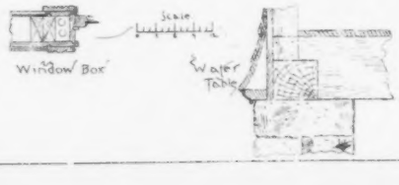
Doors etc.

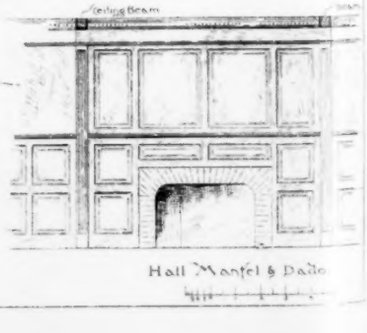






Front - N.W. Elevation.





Heliotype Printing Co. Boston.

Heliotype Printing Co Boston

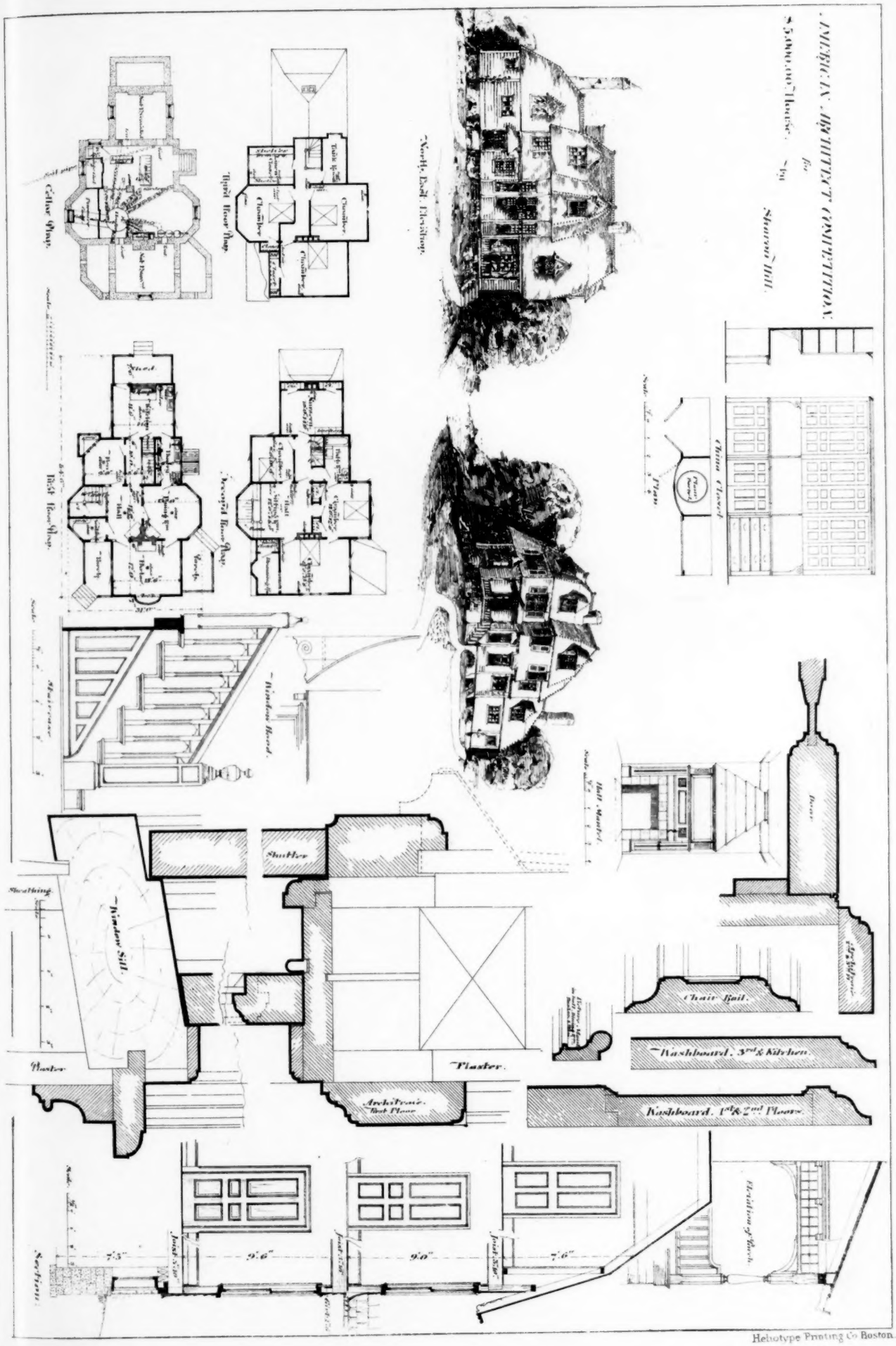
COPYRIGHT, 1886, TICKNOR & CO.

BUILDING FOR MESSRS. ELMER & AMEND,

3D. AVE. AND 18TH. ST. NEW YORK.

MESSRS. DE LEMOS & CORDES, ARCH'TS.
NEW YORK.

COPYRIGHTED, 1886, TICKNOR & CO.



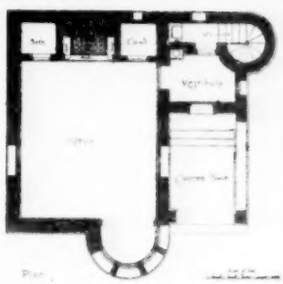
Heliotype Printing Co. Boston.

COPYRIGHTED, 1886, TICKNOR & CO.

PERSPECTIVE SKETCH

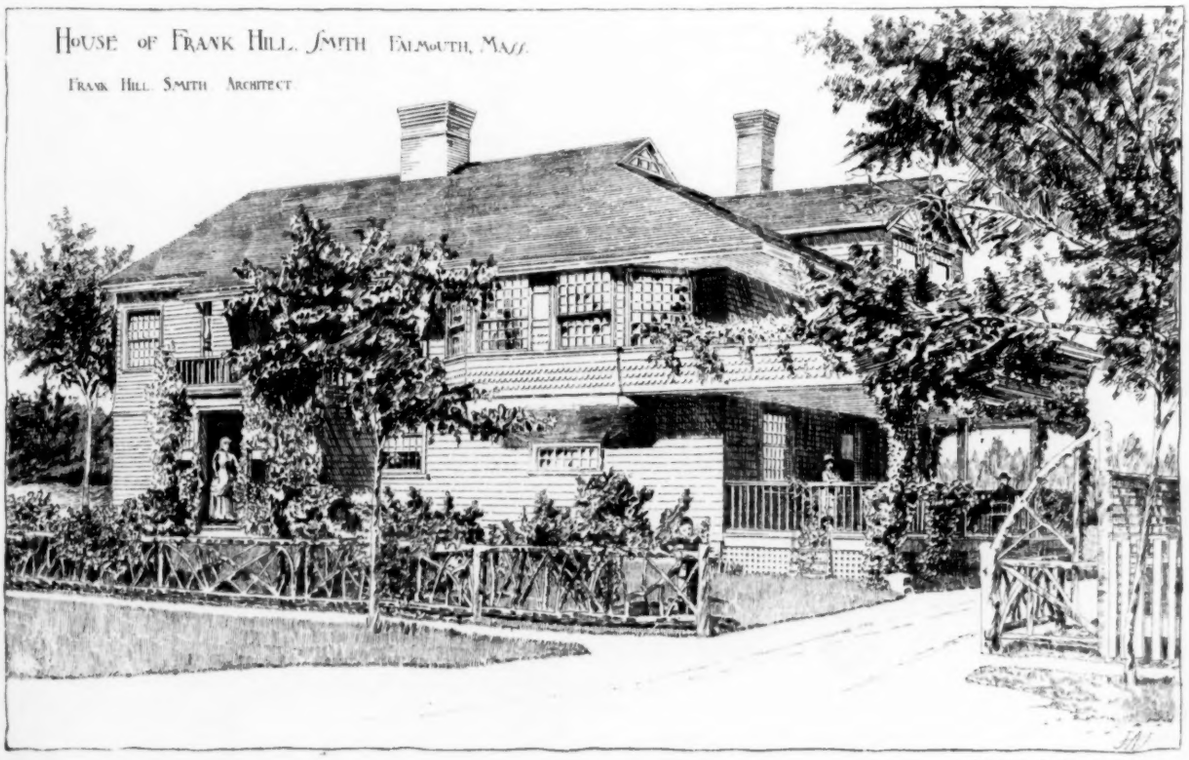
of Office Building for Holyhood Cemetery Brookline, Mass.

Thomas O'Grady Jr. Architect
Boston, Mass.



HOUSE OF FRANK HILL SMITH FALMOUTH, MASS.

FRANK HILL SMITH ARCHITECT



Heliotype Printing Co Boston

COMPETITIVE DESIGN FOR A $5,000-HOUSE, SUBMITTED BY "*Sharon Hill.*"

MASONRY.

Preliminary,	$10 00
Excavation,	30 00
Foundations,	363 00
Hatchway or area,	24 50
Chimneys, mantels and grates,	410 00
Lathing and plastering,	350 00
Cellar bottom,	15 00
Miscellaneous, stone sills,	4 20
Total of masonry,	$1,236 70

CARPENTRY.

Frame,	$395 00
Frame covering,	225 00
Roof,	480 00
Windows,	275 00
Dormer windows,	58 00
Veranda,	35 00
Cellar windows,	35 00
Bay window,	290 00
Floors,	85 00
Doors,	225 50
Stairs,	262 00
Wainscoting and base,	50 00
Pantry and butler's pantry,	40 50
Kitchen sink, etc.,	13 50
Tank,	25 00
Bath-room,	25 00
Water-closet,	16 50
Dressers,	21 00
Cold-air duct,	15 00
Coal-bins and partitions in cellar,	19 00
Fences,	100 00
Miscellaneous,	100 00
Painting,	450 00
Tinning, slating, and galvanized-ironwork,	15 00
Plumbing and gas-fitting,	458 00
Total for house,	$4,950 70

COMPETITIVE DESIGN FOR A $5,000-HOUSE, SUBMITTED BY "*Two Dromios.*"

HOUSE FOR GEORGE ALFRED TOWNSEND, ESQ., SOUTH MOUNTAIN GAP, MD. MR. E. M. WHEELWRIGHT, ARCHITECT, BOSTON, MASS.

A CORRECTION.

We are requested to state that the "design for a panel and border," shown in one of the plates illustrating the work done by the students of the class in decoration at the Museum of Fine Arts, which were published in our issue for October 9, was the work of Miss M. C. Sears, and not of Miss Goldthwaite, as stated.

AMERICAN ARCHITECT COMPETITION FOR HOUSE COSTING $5,000.[1]—IX.

"*Sharon Hill.*" — Plan ordinarily good. Waste room in second-story hall. Constructive details good and very well rendered. Artistic details very poor; eaves especially so. Design of exterior poor, and made worse by a villainous rendering. Good rendering has clean but not hard lines. Shadows well defined, but not too dark; but little if any cross-hatching. Surfaces rendered in tones, not in spots and daubs. Rendering of plans is equally bad. Lettering is too large in scale and too fussy.

"*Cragside.*" — Waste room in halls. Dining-room inconvenient. Kitchen is small. Details throughout poor and thin. Exterior very poor. Square bay placed diagonally on corner is always bad, and especially so when surmounted by a useless and ugly canopy. Lack of mouldings and atrocious method of hooding window in peak of roof makes it look like a window in a tin house. Lettering very bad. Rendering coarse, uneven, unskilful and disagreeable.

"*No Shade*" is true to his motto and sends a design with outlined perspective without shadow — a wastefully planned house, with poor proportions and details.

THE TIMBER MANOR-HOUSE OF LANCASHIRE AND CHESHIRE.

POMPEIIAN KITCHEN.

In the days when the Scots were wont to come harrying through the plains of Lancashire, and when the Welsh were threatening across the Cheshire borders, it was a needful thing for a gentleman of either county to make his homestead in some place of vantage against the invader. If it happened that a hill rose from the level, or there was a favorable bend in the river, the position of the house was decided; but when nature did not lend herself to his defences, he built it still as stoutly as might be, and fenced it around with an open moat, and gave admission generally by a drawbridge only. Stone was scarce and difficult to procure, except in the hilly country to the northeast; so the basement alone was built of it, and the superstructure was framed in gigantic beams of oak, placed at intervals, and with a view to effect, the spaces between them being filled in with wicker-work, covered with clay and afterwards with plaster. Lancashire and Cheshire were richer in this "magpie" or black-and-white half-timber work than any other district of England, and they may be proud of the numerous examples of it which they yet possess.

[1] Continued from page 158, No. 562.

Often in the suburbs of some busy centre of the cotton industry wil a quaint old mansion be found amongst the cottages, smoke-begrimed like them, and falling into misery and decay; and again, far away in the country, where the cattle stand up to the flanks in the long grass, and a cornfield stretches behind, we see the picturesque gables peeping above the hedgerows, and there are pigeons strutting about mediæval dovecots. Some of these manor-houses are preserved fittingly by owners who value them; but, too often,

An orchard, and a moat, half dry,
Remain, sole relics of a power passed by,

or the house is utterly defaced, or has fallen into decrepit and picturesque decay.

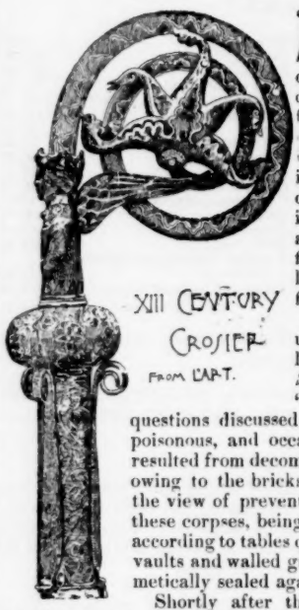
These manor-houses, when they had any pretensions to importance, were never built on an ordinary rectangular plan; they were E-shaped, L-shaped, or quadrangular, but the quadrangular mansion, surrounded by a moat, may be taken as the best type. Leland describes Morley Hall as standing upon a stone basement which rose six feet above the waters of the moat, and as otherwise "al of tymbre after the commune sort of building of Houses of the Gentilemen for most of Lancastreshire," and, he might have added, of Cheshire, too. In mediæval times, from before the year 1300, the moat was usually crossed by a drawbridge, which, in the Tudor period, was occasionally replaced by one of stone. In the waters below grew the *acorus calamus*, or sweet-flag, a pleasantly-scented reed, which was used to strew the floors of the chambers within. Entering the building beneath the archway, the visitor found himself in a quadrangular court-yard, where often yew-trees grew, as at Speke, and where sometimes a sun-dial stood. The domestic offices and dwelling-rooms which surrounded him were generally painted black and cream-color, the timbering being very ornamental in places, and the irregular distribution of the gables and roof-trees gave a very charming sky-line. Opposite to him would be the great hall, with its characteristic projecting bay, and the lord's chamber, and, near them, the kitchens, with the buttery and pantry; the withdrawing-room and dancing-gallery might be on one hand, and the domestic chapel and priest's room on the other; then there were the servant's apartments, the bed-chambers and other domestic offices. The great hall was the principal chamber of the house, where the lord kept up his state with his retainers about him, and where he gave great hospitality both to strangers and to friends. It was entered from a passage leading from the court-yard through an archway in a carved-oak screen, and the aspect of the interior was usually very fine, for the hall was sometimes nearly fifty feet long and about half as wide, and it might be larger. Some of the later halls have flat ceilings; but the open-timber roof is the better type, and some very admirable examples of it yet remain, as at Rufford, where carved angels support the shields, and at Baguley, where the work rests upon wooden arches and pillars, the spans being filled with open trefoil tracery. At the far end of the hall stood the lord's high-table upon a dais, with a carved canopy over it, and there he sat with his family and friends, while the retainers were in the space below. The lord had a great projecting bay near him, which had seats in it, and served almost as a drawing-room; and the musicians were placed in a minstrels' gallery constructed over the entrance-passage at the far end of the hall. Near the lord, also, was the immense arched fireplace, with its ingle-nook, where he could sit when the wind blew cold without. All these are features illustrated even now in very many of the existing manor-houses of Lancashire and Cheshire. The smaller hall, or lord's chamber, was entered from the daïs, and was an elegant room where the family sometimes dined in private, especially when the great hall was cold and draughty in winter. It was a pleasant place in summer, too; for it often had a bay projecting into the garden, with a doorway, a feature sometimes very picturesquely treated, as at Ordsall, near Manchester, where the door is placed between the small *vis-à-vis* bays. The ladies' withdrawing-room was close at hand, and was an apartment of considerable elegance, often, in later times, with an elaborate plaster ceiling, divided into panels by carved beams, the panels, as at Speke, being enriched with fruit and flowering shrubs in high relief. The most elaborate example of plaster-work in Lancashire is probably at Astley Hall, near Chorley, where the pendentives are cherubs in the Italian taste, which would doubtless fall if lead had not been used in their construction. The largest of the apartments on the second floor, reached often by a circular staircase, was the gallery or dancing-room, where one may picture many a gay scene of stately dance when the neighbors came together, and may fancy yet that the echoes of mediæval music linger. At the last-named hall, which indeed was partly reconstructed in Jacobean times, a good example of the dancing-gallery remains, with its windows and bays extending the whole length of the façade, some seventy-two feet in all. The chamber is panelled in oak from floor to ceiling, and quaint, tall-backed chairs stand against the wall, with carved presses and cabinets of great richness. But the most interesting piece of furniture in the room is an ancient shovel or shove-groat table, very massive in its framing of oak. "Hit him down, Bardolph, like a shove-groat shilling," says Shakespeare in allusion to the game that was played upon it. The remaining portion of the upper floor of these north-country manor-houses was usually occupied by the bed-chambers, which had a plea-ant outlook into the court-yard, or at the great barns and stables, or over the moat at the yellow cornfields beyond. The domestic chapel, which often formed a picturesque feature in the main building of the house, stood sometimes

apart, and was occasionally placed beyond the moat. In nearly all these houses hiding-holes exist, or the traces of them, especially in those built or reconstructed in Tudor times, when recusants were hunted for, of whom there were plenty in Lancashire and Cheshire. A good example of the hiding-place may be traced at Moreton Hall, where two apartments are entered by a sliding panel, and where an arrangement in the floor enabled a fugitive to reach them from the farthest end of the house. The farm-buildings of the manor-house stood apart, perhaps in a separate quadrangle or at a little distance from the main edifice, the chief being the great barn, erected on a church-like plan, with nave and aisles, and sometimes, as at Ordsall, with transepts also.

Such a building as is here sketched is a fine example of the mediæval dwelling-place, where the lord lived with his family and adherents, at peace with all except such as the drawbridge excluded. The community needed little help from without; for it had corn-land enough for its wants, and there were pastures where the kine fed and the sheep fattened; then there were dairies, barns, and stables in abundance, and the lord had hawking enough for his entertainment. Besides, it had its domestic chaplain, who not only ministered in religion, but was also the instructor of its youth and the custodian of such a library as it possessed. It is not unnatural that a certain independence should have been engendered in the lord of such a household; and, as a matter of fact, he did sometimes carry things in a somewhat high-handed manner with his neighbors, though, on the whole, he was placable and patriotic, as became him, and he had many kindred about him, so that he was felt to be a power in the State. When need was, he would go forth with his men-at-arms and his bowmen and spearmen in his train, and do many a doughty deed in his country's battles. His name was recorded amongst the victors at Cresey, Poictiers, Agincourt, and elsewhere; and he fought and suffered for the Red Rose of Lancaster. It is not surprising that the house he inhabited should have become the centre-point of many a legend and story, or that its panelled chambers and mysterious hiding-places should be deemed to have tenants other than those of the flesh. Perhaps, as at Samlesbury, there may be some strange story of witchcraft told of it; or, like Kempnall, it may heretofore have been inhabited by demons; or there may be a mysterious skull in its chambers, as at Wardley, where the Tyldesleys dwelt.

One of the most interesting timber manor-houses in Lancashire is the very characteristic one of Speke, near Liverpool, built by Edward Norreys, in 1598, and whose hall is enriched with a wainscot, probably brought, with other treasures, from Holyrood by Sir Edward Norreys, who fought at Flodden Field. Here we have the quadrangular structure, with the quaint gables and the yew-trees overshadowing them, and the encircling moat, now dry, crossed by a bridge of stone. Ordsall, already alluded to, the ancient residence of the Radcliffes, although sadly decayed, is distinctly noteworthy on account of its magnificent great hall and its characteristic barn. The ancient hall of Smithills, near Bolton, will excite the interest of many visitors, because of its old-world aspect, its quaint panelling, its curious carvings, and its glass; and the celebrated Hall i' th' Wood, not far away, with its mixture of picturesque woodwork and weather-stained stone, and its story of Samuel Crompton, with his "mule" concealed in its attic, is scarcely less interesting. This district is, indeed, rich in remains of timber architecture; and the Halls of Great Lever and Little Bolton, as well as Tyrton Tower, all deserve much notice. Rufford Old Hall is another admirable example of the Lancashire manor-house, picturesque in its wood and plaster, and filled with the most elaborate carving internally. Samlesbury, near Blackburn, built about 1548, by Sir Thomas Southworth, has a hall with a very fine timber-roof, and a chapel of some importance; and there are points of great interest in the halls of Agecroft, Denton, Newton, Ince, Wardley, and in many others scattered over the county of Lancashire. Cheshire, although not quite so rich in manor-houses as Lancashire, possesses some of great age and beauty. Of these, Baguley, the residence of Sir William Baguley or Baggiley, in the days of Edward II, which, indeed, has fallen to the position of a farm-house, is a magnificent example even yet of a mediæval dwelling-place of the fourteenth century. Bramhall, of the time of Edward III, with its long record of continuous habitation by the Davenports, is a place to awaken memories, and the quadrangular hall of Adlington, with its additions of various dates, is a place that well deserves study. To these, dotted about the county, may be added Wythenshawe Hall (*temp.* Edward III), and Holford Hall, heretofore the residence of the Holfords and the Cholmondeleys and of the "bold Lady Cheshire," where many a gay assembly took place —a quaint old house with a massive bridge of stone over the moat. There are very many others almost of equal interest, the names of which would be too numerous to record here; and as to the quaint old farmhouses, with a timber gable or two left to them, or perhaps some detached building of mediæval times used as a barn or a dairy, they must be left to the traveller to discover. The singular richness of Lancashire and Cheshire in mediæval manor-houses, or the remains of them, points to the prosperous condition of the counties at the period. Unfortunately, as time goes by, it tells disastrously upon such as are ill preserved, and these are tending fast towards decay; but it is well that there is some permanent record of a number of them in Mr. Henry Taylor's very intelligent work on the "Old Halls of Lancashire and Cheshire," and in several other books on the subject.— *Saturday Review.*

UNHEALTHY CHURCH VAULTS.



About the end of 1882, complaints were published in the newspapers respecting the escape of foul gas into the parish-church of Ippledon, in Devonshire, from a corpse buried in a wooden coffin under the chancel of that edifice. This occurred notwithstanding the coffin was covered with a coating of cement, and was enclosed in a brick-and-mortar receptacle, and the space between it, and the flags of the chancel — which were laid in best Portland cement — was filled with earth.

That subject I took as a text, upon which I wrote an article, published in the January number of the *Sanitary Record* for 1883, entitled "Gas-tight Graves." Among other questions discussed in such, I pointed out the very poisonous, and occasionally mortal, effects which had resulted from decomposed bodies under sacred edifices, owing to the bricks, cements and mortars used, with the view of preventing the exhalation of gases from these corpses, being all more or less permeable to air, according to tables quoted. I also stated how I thought vaults and walled graves under churches might be hermetically sealed against the emission of effluvia.

Shortly after the nuisance referred to, horrible stenches arose in one of the City of London churches from the corpses interred beneath; and the authorities used a thick coating of concrete in the hope of stopping these odors. Very recently the Church of St. Mary Woolnoth, Lombard Street, has been closed to adopt means to prevent exhalations within it from a vast number of decomposed human remains in the vaults below.

Now as I had reason to believe that the condition of these receptacles were as bad as could be found, I inspected them by the kind permission of the rector of the church. They presented the most unhealthy and repulsive appearance. Several of the coffins were exposed; some of the lids were open, and one, I noticed, contained human remains in a state of decomposition. Most of the coffins in these vaults are of wood. The very small quantity of earth which had been used to cover the coffins had many and great inequalities of surface, as if dogs or jackals had been scratching it. The dimensions of the main vault are about 30′ x 20′. A small vault or recess communicates with it. Both have arched roofs of common bricks and mortar, and are very pervious to foul air. Within the larger vault there are about them small shafts about two feet from the roof, leading into the tower, intended for the escape of corpse gas; but as there appears to be no artificial inlet for the admission of fresh air into the vaults, or any exhaust at the summit of the outlet, it would not get rid of a material amount of the effluvia unless the enclosures suddenly became charged with an extraordinary amount of such by the bursting of a coffin.

The Lombard Street Post-Office adjoins St. Mary Woolnoth Church, and one of the leading employés in that establishment told me that the odor which was perceived there from the corpses in the vaults was at times almost unbearable, notwithstanding the entrance doors to the office are continually opened. He added that he had frequently complained of this nuisance. Only a brick wall appears to divide the vaults from the post-office. It is not surprising, therefore, that it is permeated by poisonous gases from the vaults.

In order to render these enclosures healthy it is intended by the direction of Mr. Penrose, architect and cathedral surveyor of St. Paul's Churchyard, who will have the supervision of the work, to cover the coffins with earth, and to lay on the surface corrugated-iron joists, embedded in and covered with concrete and surmounted with asphalt. By these means, I think the escape of all underground air will be stopped; as it has been experimentally demonstrated that asphalt or a substance containing tar is the only composition which is impervious to gas.

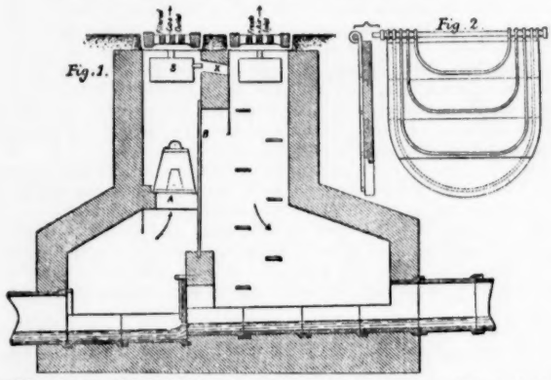
Although statute law exists to prevent church vaults being dangerous to health, no provision is made by any legislative enactment or otherwise for periodical inspection of these receptacles. The facts, however, disclosed by the appearance of the vaults at St. Mary Woolnoth Church, render this step urgently necessary, as it clearly shows that even when bodies have been interred in leaden coffins for more than thirty years they may become highly dangerous to health. Other facts may with great reason be mentioned in support of this much required reform; one is that under several urban churches, corpses have been interred in wooden coffins only, so that the decomposed matter of their contents must have greatly poisoned the earth, and added to the unhealthiness of the vaults wherein they were deposited. Cases are recorded in which persons have died from the effect of grave-earth mixed with decomposed corpses accidentally coming in contact with cuts or bruises on their hands. As wooden coffins are made of different kinds of material, and of various degrees of thickness, and are placed in some vaults wherein they will be preserved for a greater length of time than in others, much

danger is likely to result to public health from wooden coffin vaults, even if they have been closed for forty or fifty years.

Again, it is generally thought that if human remains are interred in leaden coffins, either effluvia will not escape from such, or, if it does, this will only occur after the lapse of twenty, thirty, or more years, consequent upon the deterioration of the receptacles, when it is supposed the gas will have lost by far the greater part of its toxic properties. Now there is a considerable amount of reliable testimony to the contrary, some of which was disclosed in the Parliamentary and other official inquiries more than forty years ago respecting the injury to health in cities and towns by the interment of bodies under and about churches and chapels. It has been proved that leaden coffins have liberated gases from their contents, either from defective soldering, or from being torn by the force of the effluvia. Then as to the poisonous power of this gas after being confined for forty years or more, although no analysis appears to have been made of such, it is doubtless very great: for among other facts and opinions expressed on the subject it is stated before a Parliamentary Committee, by a medical man, who had examined many church vaults, that when the portion of an old graveyard was dug up in the metropolis to make a sewer, one of the workmen accidentally struck his pickaxe into the coffin in which the corpse had been enclosed fifty years previously, and so perceptible was the gas that "it issued from the coffin like the steam from a teapot, and the stench was insufferable."

From the foregoing facts and observations, and the probability that the vaults of many London and other urban churches would be found to be as dangerous to health as those of St. Mary Woolnoth, it is very necessary that steps should be commenced to provide for the periodical inspection advocated without delay.—*J. Neville Porter, in the Sanitary Record.*

A SYSTEM OF SEWER VENTILATION.



MR. G. E. EACHUS, of 3 Great Queen Street, Westminster, acting in conjunction with Mr. P. Maignen, whose name is so well known in connection with the "*filtre rapide*," has devised a system of sewer ventilation, by which the gas emitted from gullies and man-holes in the street, is rendered inodorous, and a very serious nuisance, particularly in towns built on flat land, is avoided. When the present stenches are removed the repugnance of householders to have ventilating gratings opposite their houses is removed, and hence a much more efficient flow of air may be obtained through the sewers, and the gas may be diluted to an extent which renders them as little objectionable as such matters can be made. With free and separate openings for inlet and outlet no pressure can accumulate in the drains, while gusts of wind and eddies only tend to make the flow of air more rapid. The inventors, therefore, recommend the use of valve closets, without siphon traps, and they thus gain an unobstructed passage for the sewage matter from the house to the outfall, without any cavities in which time is afforded for putrefactive changes to take place.

The sewer is divided into short lengths of about three hundred feet each, each section being separated from the next by a non-return flap-valve (Figs. 1 and 2, above), which opens when the liquid current is in the normal direction, but closes if the flow should be reversed. This valve is very ingeniously arranged. It is made in four or more sections (Fig. 2), each separately hinged to a rail above the water level. These sections open separately; at ordinary times, when there is no storm-water, the upper three remain shut, and prevent all flow of air into the next section, the current being diverted up the man-hole and through the filter. The man-hole is divided into two shafts, one for inlet and one for outlet. In each there is hung a dirt-box; that in the upcast shaft discharges its overflow through a passage in the partition into the downcast shaft, and thus the filter is never wetted. The filter may be of any efficient construction, that shown on the engraving being two perforated truncated cones, with the intermediate space filled with charcoal. It is found that the charcoal remains dry, and performs its office satisfactorily, even if not changed, for twelve months.

The system has been tried for some time in the Town-Hall at Edmonton, where it has worked admirably, and experiments are now being made with it at Newcastle by Mr. G. W. Laws. Mr. Eachus obtained a gold medal at the Inventions Exhibition.—*Engineering.*

THE WORLD'S FUTURE FUEL.

THE Scranton Board of Trade recently published a report on the anthracite coal industry which takes a roseate view of the future of the fuel question. Properly assuming that the welfare of the human race depends largely on its skill in obtaining artificial heat and power, the report argues that the deposits of anthracite in Pennsylvania are destined to be the chief source from which mankind, in North America at least, are to be supplied with comfort.

In order, however, not to exhaust the supply prematurely and unnecessarily, improved methods of utilizing this coal must command the attention of the country. To two of these improved methods the report is largely devoted. That the present method of using coal, or indeed any kind of solid fuel, is wasteful in the extreme, has long been maintained by scientific investigators. In the general utilization of coals only from ten to twenty-five per cent of possible heat is made available. If its claim is well founded, the field for invention in the direction of greater economy in the use of fuel is certainly inviting. The two improved methods discussed in the report under consideration consist of burning coal in a pulverized state, and in using it for making fuel gas.

Pulverized coal has been used for some time in a few localities, it is claimed, with entire success. The National Armory in Springfield is one of these places, this method of consumption having been introduced there in 1883. The coal is reduced to a powdered form so fine that it will float in the atmosphere, and it is carried into the burning furnace by a current of air artificially produced. In the powdered form everything is consumed, making no smoke and leaving no ashes. Machinery for pulverizing the coal has been brought to a satisfactory stage of perfection, and it is claimed to be both economical in use and comparatively inexpensive in construction. By pulverizing the waste coal at the mines, culm and screenings can be used up clean. As there are mountains of this waste now on hand, its use for pulverizing will effect an important saving of the original deposit.

The heating powers of pulverized coal are thus stated by Charles E. Emery of New York, as quoted in this report of the Scranton Board of Trade: "The finely-divided combustible, being kindled by the flame drawn from the fire-boxes, burns in the descending current with great energy, and from the comparatively large surface exposed to the action of air, generates a great amount of heat, and, with an excess of fuel, an intense light. The great fiery blast, nearly filling the tower (of a blast furnace) can, at pleasure, be made oxidizing or reducing in its action by regulating the supplies of fuel and air. I have seen it, at twelve feet from the top, so potent as to heat rapidly to whiteness two feet of a wrought-iron bar an inch in diameter, and cause it, though supported at both ends, to bend like wax beneath its own weight in thirty seconds after it was placed in the blast." For blast furnaces, for great forges, for generating steam, and for all purposes of obtaining power and heat for mechanical purposes, pulverized coal is certain to come into use, it is claimed, because of its greater effectiveness and its vastly greater economy.

But pulverized coal, superior in every respect as it is as compared with lump coal, is manifestly a crude, cumbersome fuel compared with water-gas fuel. On this subject the committee who prepared this Scranton Board of Trade report is very enthusiastic. The processes of making the gas, its component parts, and the economies of using it are set forth with a good deal of particularity. Water-gas is, of course, no new product, but the process of making it has been so expensive as to bar it out from the competition for cheap fuel. Late inventions have cheapened its manufacture, so that it can now be put into general use, it is claimed, with assurance to the consumer that his fuel for all purposes of generating power, of warmth in his apartments, and of cooking his food will be cheaper than solid fuel, while he will be rid of the annoyance of handling coal, of carting away ashes, and of having his apartments soiled by dust.

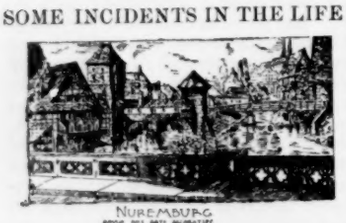
On the authority of Professor T. S. C. Lowe, who has been foremost in bringing the processes of making cheap fuel gas to their present stage, it is claimed that one ton of anthracite coal will suffice to generate from 50,000 to 100,000 cubic feet of gas. The average of 80,000 cubic feet is used in the calculations of the Board of Trade report, but the maximum number, 100,000, can be reached with properly constructed apparatus. The cost of the gas is, on this basis, and after making due allowance for cost of plant, estimated at nine cents a thousand cubic feet. When this gas is brought into general use for fuel, as the Scranton report considers to be certain,

the cost of it to consumers will necessarily vary according to circumstances; but the cost of manufacturing it for a given consumption is not at all problematical, even with appliances so far secured for making it. In the city of Troy, N. Y., a water-fuel-gas plant has been in operation since midsummer. It is the only one, it is believed, in this State. The supply is to the laundries with which the city abounds, to the collar factories for power, and to hotels, restaurants and private houses for heating and cooking. The cost of making the gas at this plant is said by the managers to be about ten cents a thousand cubic feet, and the charge to consumers is fifty cents a thousand cubic feet. It is used in gas-stoves and heaters that are comparatively inexpensive because they are simple contrivances which give no trouble in their management. The gas furnished is non-luminous, the blaze resembling that from alcohol. It is, however, intensely hot. A common nail held in the blaze of a jet with a pair of tongs will be heated to a white heat in a few seconds. The gas has no odor.

The process of manufacturing and using this fuel is claimed to be already so nearly perfect as to secure its rapid introduction to use, while a tempting offer is thrown out to the public in the way of cheapness and convenience. The Committee of the Scranton Board of Trade are refreshingly sanguine on this subject. "The contemplation of the gas subject in the anthracite coal fields," they say, "is almost like an Aladdin story. In scientific nomenclature, it may properly be designated as anthracite gas." They make an estimate that brings the cost of manufacturing this gas down to less than two cents a thousand cubic feet. If the cost of making and distributing it to consumers can be brought to ten cents a thousand, the cost to consumers can be so low as to drive out solid fuel. The inducement to capital to undertake the introduction of this kind of fuel is set forth in estimates made by Professor Lowe, who is the inventor of the improved methods of manufacture. He says: "The advantages of the gas over coal would enable the consumers to pay an average of forty cents per thousand cubic feet for the gas, which would then be to them as cheap as other fuels. At this price it would be equal (to the manufacturers) to selling coal at $32 per ton, and at thirty cents per thousand cubic feet to the consumer, $24 per ton." Professor Lowe truly remarks that here is a margin large enough to pay satisfactory dividends on all investments necessary to supply good-sized villages and cities. Further he says: "One thousand cubic feet of gas per day to each ten inhabitants for manufacturing, domestic heating, cooking and lighting, is a low estimate; nevertheless at this rate a city of 50,000 people would consume 5,000,000 feet daily, which at 40 cents per 1,000 feet would be $2,000 per day gross income, to produce which would require sixty-three tons of coal and the labor of ten men, besides book-keepers, collectors and officers, the expense of which is easily figured."

The vision of the Scranton Committee, as shown by their report, rests finally on a project to make this water-gas fuel in the very mines of the anthracite deposits, piping it thence for consumption; in other words, taking up the hint nature has dropped in the shape of natural gas, these sanguine gentlemen see the possibility of going under ground for the purpose of continuing the supply of gas by artificial means when the natural supply fails, and of competing with the natural supply if it does not fail. — *N. Y. Evening Post.*

SOME INCIDENTS IN THE LIFE OF H. H. RICHARDSON.



A WRITER in the Boston *Transcript* gives us this glimpse of Richardson's probation after he finally returned to America:

In the year 1866 I was boarding in Brooklyn, N. Y. One day, on returning from my daily walk, I noticed some large, brass-bound boxes in the hall, marked "Paris," and also "*Etats Unis.*" Aye! I said to myself, we have a new boarder; and those who make a home in a private boarding-house know that there is much curiosity felt at the advent of a new comer. At the six o'clock dinner there appeared at table a gentleman whom I judged to be about twenty-six years of age. Let me describe him exactly as I recall, to-day, his looks at that time. He was of good height, broad-shouldered, full-chested, dark complexion, brown eyes, dark hair parted in the centre, and had the look of a man in perfect health and with much physical vigor. He wore his clothes, which fitted him well, with an indescribable air of ease, differing much from the other gentlemen at table, who, though no dudes, followed the fashion closely and seemed self-conscious of their good appearance. The stranger appeared to me like one who had dressed himself properly in his room and thought no more about it afterwards than he did about the color of his hair or the shape of his head. His cravats had a careless ease about them which the others had failed to win. His shoes were thick, broad-soled, and looked more as if made in England than in France. This gentleman was my next-door neighbor, his room being between the bed-room of my son (a young clerk at Claflin's) and my little parlor. Thus we met often in going to and from the dining-room, and naturally learned something of each other. He said that he had just come over from France, where he had been for some years in the Polytechnique School. Now and then he came into the little parlor and chatted awhile. I could not talk French with him (he preferred that to English, for he had used it so long), but I read the language easily, and he kindly offered his books for my reading. These books explained his profession. They were upon architecture and kindred studies; how valuable I was not aware at the time. From himself I learned that he was a direct descendant of Priestly, and when he found that he had an interested listener he told me about his mother, who was then living in New Orleans. Mr. Richardson stammered in his speech, and as one near to me had the same defect I was never embarrassed by this hesitation, and perhaps he talked more freely on that account. He said that immediately on coming to New York he had entered into partnership with a gentleman whom he met in Paris, and who had offered him a position when he (Mr. Richardson) should arrive in the United States.

We had been boarding a month or two at the same house, when I had an opportunity to buy a pretty little house, and, preferring the quiet of home, decided to go to housekeeping. Mr. Richardson went to see the house, and in the evening he came into my room and said, "Mrs. P., I want you to take me as a boarder."

"Why, Mr. Richardson, I know nothing about keeping boarders."

"No matter if you do not," was his reply. "All I want for breakfast is hash, with the addition of a cup of coffee so strong that you can never wash the cup white after using."

"As to the coffee, Mr. Richardson, you can have that," but to the hash I demurred. "A Parisian, as you seem to be, and want hash every morning!"

Then he gave me a sketch of his housekeeping in Paris. He had a suite of rooms with a fellow-student, and a "*vielle fille*" as servant, who probably with the skill of a French woman made some sort of "*hachis*" or ragout which was very toothsome, but which in the hands of an Irish servant would be as palatable as witches' broth. There was little more said upon the matter, and I went to my old home to forward furniture and bedding. My son went to the house and decided to remain there; but feeling lonely at night, was very glad when Mr. Richardson proposed to join him, taking their meals at a restaurant. They unpacked mattresses, blankets and pillows, and came home tired enough at night to enjoy the freedom of their life. Mr. Richardson, with the ease and rapidity of long practice, rolled up his cigarettes, and then would tell the younger man of his life in France; of the cathedrals of the Old World; of Herculaneum and Pompeii, and the grand palaces of Europe.

I was puzzled on my return to know what to do with my cultured gentleman — for gentleman he was, in every sense of the word. If he had been less so, the difficulty would have been greater.

He occupied a small back parlor, quiet and retired. Here he brought his library, and here he spent many hours of patient study, as we shall see. We had a faithful servant, who would make the coffee exactly as ordered, but other dishes supplied the place of the hash.

After a few weeks he came to me and said, "I have dissolved my partnership. I stand alone in the world, without the means to pay my way."

There was a proud humility in his manner which amused and interested me.

"Do not be troubled," I said. "Something favorable will turn up after awhile. Stay on with us."

I did not know the man well enough to understand his strength, and the veiled genius that walked by his side was hidden from my eyes. I knew he was in perplexity, but I failed at the time to fathom the undercurrent of despondency which troubled his life.

There were two things which buoyed him up in those days of gloom — the attachment to the lady afterward his wife, and the care of himself physically. No matter how cold or freezing the weather, he plunged every morning into a large bath-tub full of cold water; and with his well-fitting, nicely-made brogans, which seemed to do half the walking for him, he took long walks, and felt the better for the exercise.

He one day broached the question whether marriage was or was not an impediment to a man whose ambition led him to aim at a high position in art.

Of course, woman-like, I argued that loneliness and lack of sympathy would only hamper even an artist, who wished to attain to the full measure of a man.

"A tower of strength
To stand four-square to all the winds that blow"

Then he told me of his engagement. Of all the men whom I have known, he had at that time the purest and noblest views of true marriage. He wished me to see the lady, and when I went to Boston he gave me an introduction. On my return, I could most sincerely congratulate him on his choice.

One evening he said to me, "I am going to Tiffany to see if I can get work in shaping and ornamenting gas-shades."

There is some difference between designing gas-shades and drawing the plans for Trinity Church, Boston, but a true genius manifests itself in small as well as great things. "The thunder that smites the Alps can gather itself into the width of a golden wire."

Gas-shades at that time were neither artistic nor beautiful. If Richardson had taken them in hand, they would have been unique and attractive. Whether Tiffany had need of such work I never learned — if so, the worse for Tiffany and the better for Richardson.

He was going to the Century Club one evening, and as he passed

out of his room he said, "Look at me, I wear a suit made by Poole, of London, which a nobleman might be pleased to wear, and — and — and I have n't a dollar to my name."

He said this so cheerfully, and with that same proud humility to which I have referred, that even then I did not realize his despondency.

It was a dark hour to him. Such hours come to all men who achieve greatness. They are inseparable from that patient, slow climbing which all men of genius understand. It was the trial hour of the great architect, and he came out of it the stronger for the struggle, like the strong swimmer, who, breasting wind and tide, finds the innate strength of which he had not before been conscious, and reaches port in safety.

Meanwhile Mr. Richardson was busy with his pencil in the little back parlor. Not far from this time came the sad news of his mother's death. At once — he could hardly wait for the next train — he must go for sympathy to the one who held a place in his heart next to his mother. There was a child-like simplicity about this man which he may have hidden as he came more in contact with the world, and his life was filled with work and care, but it was in his nature.

He told us that when he was at school in Paris, he was bountifully supplied with money from home, but during our Civil War, suddenly, to his great annoyance, all remittances stopped.

"How could you live?" I asked.

"Ah!" said he, "I had classmates and other old college friends in Paris, and they were generous and full of sympathy. The names of these friends were often on his lips, for he delighted to recall his college days. I had great reverence for Harvard, because of a long list of ancestral divines, who had graduated there; but my veneration was changed to admiration of the jolly, genial fellows who rallied round Richardson in those dark days. Their names are now before me, and though the class were remarkable for their *cœur d'esprit*, they builded better than they knew when they stood so firmly by their friend.

Say what you will, no man climbs the ladder of fame wholly unassisted. Our Gethsemanes are trodden in unshared agony, but on the upward Alpine path the guides and alpenstock are at our service.

At last Mr. Richardson disappeared for a day or two. On his return he said that he had been introduced by a friend to Mr. Chapin, president of the Boston & Albany Railroad, and through his influence he was to be the architect of a new church in Springfield, Mass. He went to work with great interest, though he had not been idle during his waiting time.

He showed me some of his plans. I had neither the knowledge nor the culture to appreciate them fully, yet I could instinctively feel beauty and know when work was well done, even though I was ignorant of the difference between the Venetian Gothic and the Lombard Gothic and the various orders of the Renaissance. One thing is certain — if "the value of any work of art is exactly in the ratio of the quantity of humanity put into it," then Mr. Richardson's work was good, for he put his soul into it. He believed in "bold, rich, living architecture," and in good work or none. In his estimation poor architecture had no "*raison d'être*." He used jokingly to tell about a student at the Polytechnique who was kept a whole year drawing chimney flues. Probably, then, they would be more useless to draw smoke upwards than the hole in the roof of a Laplander's hut. He did not like that the architect should be fettered by lack of money in the builder. In his view, the best use of money is to spend it in architecture to which posterity may point with pride.

I am trespassing on the work of the critic. My simple story is to tell how this church broke the monotony of the long waiting and gave him something to do worthy of his hand. A dead wall no longer shut him in, or, to use a homely phrase, he knocked it down with stern patience and a strong will and then revelled in the sunlight. I use the right expression, for he rejoiced in his work, and more and more the master-mind guided the cunning hand to nobler work, for his delight was in the grand laws of architecture, and is not that in a true sense the law of the Eternal?

From this time Mr. Richardson gained steadily in his profession, but not until he removed to Boston was the full measure of the man appreciated.

A hand more able than mine will write his life, and show us how, by the thoroughness of his work, his untiring industry, and more than all, by the originality of his genius, he takes precedence in his profession.

Alas! In the strength of his manhood, when he had girded himself for nobler work than any which he had yet wrought, death called him away, and he passed from us to the "immortals."

COMMUNICATIONS

THE POINT OF GREATEST DEFLECTION.

Trenton, October 5, 1886.

To the Editors of the American Architect:—

Dear Sirs, — Permit me to call attention to a common error which occurs in the article in "Safe Building" in your issue of October 2. The greatest deflection of a beam loaded with a single load not at centre of the span is there stated to occur at the point where the load is applied.

A simple experiment with a flexible strip will show that this is not true, the greatest deflection occurring at a point between the load and the centre of the span. A simple formula for determining the position of this point correctly and also the amount of the deflection is given in the hand-book published by the New Jersey Steel and Iron Company, edition of 1885, page 34*a*. With the nomenclature used in your article the position of the point of greatest deflection would be $\sqrt{\frac{l^2 - m^2}{3}}$ from the farther bearing.

Fred J. Slade.

New York, October 16, 1886.

To the Editors of the American Architect:—

Dear Sirs,— My authority for the statement which Mr. Slade complains of is Weisbach, Volume 1, § 245, and it would seem that we could not have a better authority. He gives an elaborate proof showing that the greatest deflection is where the greatest bending moment is, *at the load*. But, alas! for the fallacy of the most exact demonstration of "The Father of Mechanical Science." Mr. Slade's simple experiment, made with an ordinary tee-square completely disproves it. Since seeing Mr. Slade's letter I have consulted some thirty authorities and was amazed to find how many either ignored the point, or else worked up to it and then dodged the issue. I find, however, that Mr. Slade's formula simplifies very ingeniously one that is adopted by Weyrauch, Klasen, Dubois, and the German Ingenieur Vercin, and as its result agrees quite closely with a very elaborate formula given by Thomas Box (strength of materials, p. 364, ed. 1883). I shall be glad to make the correction before the book-plates are cast, and wish to thank Mr. Slade for so promptly calling my attention to the matter. Yours very truly,

Louis de Coppet Berg.

NOTES AND CLIPPINGS

The Crerae Quarry Accident.—On September 25 a lamentable accident, of an almost unprecedented description, occurred at the Crerae quarries, on Loch Fyne, near Inverary. The corporation of Glasgow obtain stone from the quarries, and once a year it is customary for a party of officials, their friends, and others, to visit the place, and witness a blast on a large scale. On this day 50,000 tons of rock were to be displaced. There was the additional interest of the occasion being a jubilee celebration of the Statute Labor Committee. The steamer with the party arrived off the quarries shortly after one o'clock, and was brought up a little within a mile from the shore. As on former occasions, the signal for the explosion to take place was given by the steamer sounding her steam-whistle. The charge was immediately fired, and in less than a minute the whole face of the quarry heaved outwards, between 60,000 and 70,000 tons of rock being dislodged, and the operation proving very successful, as far as the purpose for which it was intended is concerned. The smoke having somewhat cleared away, the steamer was taken a little nearer the shore, and those of the passengers who desired to do so were allowed to land in boats for the purpose of examining the result of the blast. About three hundred persons, many of them ladies, availed themselves of the opportunity, and were landed on the beach. The steamer then continued her run to Inverary, the arrangement being that she should pick up those who had gone ashore on the return journey. When the company assembled on the beach they immediately proceeded to the quarry, accompanied by Messrs. Alexander and John Faill, the lessees, Mr. Sharp, the manager, and Mr. William Sim, the proprietor, these gentlemen explaining to various groups of ladies and gentlemen the nature and extent of the operations carried on at Crerae, and the blasting processes by which the rock was obtained. In this way the visitors entered the quarry — which, it should be explained, takes in the interior the shape of a horseshoe — and there was nothing, so far, to indicate that they were incurring the smallest possible risk. Before many minutes had elapsed, however, many members of the party, at all points, seemed suddenly, and in the midst of animated conversation, to be overpowered by some invisible vapor, and fell motionless to the ground among the stones. The officials, at once realizing that the catastrophe was due to chokedamp, called out to the people to run, but in the consternation with which every one was more or less seized the warning was either not understood by many, or they found themselves powerless to act upon it. For some minutes persons continued to fall, most of them without even uttering a word or cry, and to lie upon the ground to all appearances dead. In this way it is said that in the course of a few minutes no fewer than from eighty to one hundred persons were prostrated. Eight men were killed and a large number injured.

The history of the Crerae Quarry at Furnace, and of the blasting operations there, is closely connected with the efforts made by the Glasgow Police and Statue Labor Committee during the last half century to improve the causewaying and paving of the city streets. When the management of the streets was transferred, in 1836, from the old Statue Labor Trust to the Board of Police, the thoroughfares of the city were in a miserable state of repair, and all laid with "common rubble causeway." The contractor for the cleansing and lighting of the city was Mr. William Sim, who at once entered with energy into plans for realizing the desire of the committee to improve the system of street paving. The success of these plans is described in a memorandum prepared by Mr. Sim for the occasion of the large blast of

September 25, which was fired in honor of the Statute Labor Committee's jubilee, accompanying which memorandum is a statement by Messrs. William Sim & Co., the lessees of the quarries, containing particulars of the blast and elevations of the quarry face. The first paving experiments were made with blocks of square-dressed whinstone, for obtaining which quarries were opened at Kilsyth; but the results, as indicated in the paving of Jamaica Street, were disappointing, the blocks being found pitted and full of holes after being down only three years. The late Mr. David Lyon was acting manager for Mr. Gibb, contractor for the building of Glasgow Bridge, and he afterwards contracted for the building of a quay at Inverary, and was permitted to quarry a portion of the materials from the rocks at Furnace, some ten miles to the south, and on the western shore of Loch Fyne. Soon after the Committee took over the streets management several hundreds of tons of dressed granite causeway stones from Furnace were used in paving a portion of Jamaica Street, and in 1840 this was found to be in excellent condition, the stones being in such good preservation as still to show the marks of the tools used in preparing them. The result was to convince the committee of the necessity of substituting granite for whinstone in street-paving; and in 1841 permission was obtained from the father of the present Duke of Argyll to open a quarry at Furnace, and a contract entered into to supply a thousand tons for the paving of High Street. From that date the operations for the quarrying of the gray granite of Furnace have gone on in an extending scale, so that the great bulk of the stones employed in paving the existing city streets has come from this source. In 1852 the first "great blast" took place, and was attended with such satisfactory results that the system has since been regularly continued, ten "blasts" having been fired up to the year 1855. The great blast fired on September 25 was, as has been stated, designed to be a celebration of the completion of the fifty years' labors of the Statute Labor Committee, and elaborate arrangements had been made in connection with it for the success of the operation, and for the safety of life and property. It was to be fired, as the official statement says, "immediately on the arrival of the *Lord of the Isles* at a safe distance within view of the quarry face. The gunpowder in the chambers will as usual be exploded simultaneously by means of electricity from a battery technically called an exploder. The captain of the *Lord of the Isles* will sound a steam whistle as a signal to the operators, and in less than a minute, if all goes well, the blast will be over." As the plans show, the "bull's eye," or mouth of the entrance mine, was situated 30 feet above the floor of the quarry, and from it to the top of the perpendicular face was other 60 feet of rock. Upwards from this, however, the rock had a receding rise to a considerable height, so that, in vertical line from the mines and chambers to the flagstaff overhead there was in all 100 feet of superimposed rock. The entrance mine extended backwards for 60 feet, and then divided, sending off at an obtuse angle, for other 20 feet, galleries to the right and left, each ending in a powder-chamber. Between each chamber and the face of the quarry there was a depth of 70 feet of rock, and in each was contained 7,000 pounds of powder — in all, 14,000 pounds, equal, according to the standard by which gunpowder is sold, to 7 tons. The working dimensions of the blast, from the western to the eastern dividing joint, was in width 100 feet, and taking the height as we have described it at 100 feet, and the thickness at 70 feet, there were 25,925 cubic yards of rock to be displaced, requiring, at 2 tons per yard, an expenditure of force equal to 51,850 tons. The expectation, however, of the contractors, fully borne out by the results, was that if the blast worked successfully a large number of tons additional would be removed by natural falls of the rock occasioned by the disturbing action of the explosion. As has been said, the blast was believed to be a great success by those who had charge of it. The great mass of rocks was torn to fragments by the explosion, and the belief was entertained that a greater fall than they had anticipated had been realized. Of course, the distressing nature of the subsequent proceedings naturally prevented the inspection necessary to verify the opinions formed. It may be mentioned that the blasting was carried out under the direction of Mr. Adam Sharp, the manager, and Mr. John Jardine, the engineer of the quarry.— *The Architect.*

Lime-Blasting in Coal-Mines. — An official report by English commissioners on the new method of blasting without powder, by means of lime cartridges, expresses the opinion, as the result of close observation as well as of frequent inquiries and experiments, that, for coal-getting, the new lime process can be, to a large extent, substituted for that of powder, and that its employment secures comparative immunity from danger, and is unattended by any important practical difficulties. The plan has been subjected to trial in many of the most important mining-districts, and proved itself capable of competing, and even advantageously in point of economy, with powder — in many descriptions of coal — the working being such as to allow of several charges being applied at one time. It is not claimed that this lime-cartridge system affords the means of dispensing with the use of explosives or of specially powerful mechanical appliances in the removal of stone, or even in some hard coal, or in connection with certain methods of working underground. — *Exchange.*

Novel Bells. — There is always a risk of failure in casting large bells; uncertainty whether the bell will be sound when cast, and liability to eventual fracture. The transportation of such heavy weights as bells of large dimensions to their destination, and the hanging of them when there, are always matters for serious consideration. It will be remembered what preparations were made and precautions taken for the transport of the great bell of St. Paul's, and the difficulty of its hoisting and hanging; and now, being hung, it would be dangerous to swing its enormous weight — some eighteen tons. It is of interest to note, therefore, that in England a bell has been invented which is claimed to obviate all these difficulties. This bell, as we find it described, is not cast, but made of metal, bent or spun to shape. A bell may be made in several pieces, and hand-soldered together. The peculiarity of the result is that the bells give an astonishing volume of sound. A bell weighing but three and one-half pounds gives quite as much sound as a cast bell of ten times the weight, and the tone is very pure and true. The vibrations last twenty-five seconds, and the overtones or harmonics are quite perceptible. The inventor guarantees to produce a bell weighing one ton which shall be as musical and as efficient as an ordinary bell of twenty tons. Various attempts have been made to use sheet metals for bells, but they have all failed hitherto; and the reason why the inventor has attained an unprecedented success seems to be that he has hit on a peculiar alloy, which appears to possess some remarkable properties. It is well known that ordinary bell metal is hard and brittle. In the present case, however, a method has been discovered by which a bell metal is produced which will be resonant in a very high degree, but admits of being bent. It bears, that is to say, about the same relation to ordinary bell metal that malleable cast-iron bears to ordinary cast-iron. Although the inventor, a Mr. Hoffman, of London, is confident that he can produce very large bells in this way, he has not made any, and it remains to be seen how far he will be successful; but he has done enough already to excite the interest and claim the attention of every campanologist.— *The Iron Age.*

TRADE SURVEYS

The possibility of such a boom in railway construction as will crowd prices to a permanently higher level is now attracting attention of those who operate with large blocks of capital. One railroad extension of six hundred miles has just been determined upon in the Northwest. Three other extensive railway enterprises are to be pushed to completion south of the Ohio. A dozen or more trunk-line extensions between New York and Chicago have just been resolved upon. These are simply samples of the improving activity. Unusually large orders have been quite recently given out for freight cars. Many lines report a scarcity of cars; in fact, shippers at all large commercial centres complain, more or less, of delay from this cause. Keen competition is springing up on the various Pacific lines. New coastwise ship lines will probably be established next year. Money is once more returning freely from the interior, thus laying the foundation for larger operations now projected in many quarters. Inside of the industries themselves there is great activity. Orders crowd in for winter delivery. Consumers are apprehensive of higher prices. An enormous amount of business has been done for winter and spring delivery at full prices. But for this a general advance would have been made ere this. Manufacturers have been, and still are anxious to fill their order-books. The building trades are less active than a month ago as to new business, but busier than ever on summer contracts. Skilled labor is advertised for in all our larger cities. Winter work will be abundant where it is possible to prosecute it. The characteristic of this winter's building operations will be the erection of large edifices, banks, warehouses, railroad work, tunnel work, etc. The possibility of spring labor agitation will be a factor which will affect the quantity of winter work done. Greater activity is assured in building and loan association circles next season. Real estate authorities have recently stated that lot-buying for small houses has been indulged in to a greater extent this year than ever. Large tracts have been laid out and sold in many cities and towns East and West, especially in Pennsylvania, New York and Ohio. This is the result largely of high wages and steady employment in the industries. Building material is very firm, but has not advanced. The New England lumber-trade maintains its activity. Wholesalers have been unable to accumulate supplies, and in primary markets, both West and South, mills are well supplied with orders. Contractors at home have placed large orders for sash-doors and interior lumber. It would take very little more to push prices up, but there are so many markets from which lumber can come that anything like an organized control is out of the question, therefore no advance will be made until there is no possible escape from it. New York and Philadelphia lumber markets are fairly supplied and no more. Our advices from several cities show that real estate is active, and that the bulk of sales are for those who intend to build. The Chicago brick-yards, except two, have shut down. The crop for the season is put at 370,000,000 against 335,000,000 last year. Last year the winter stocks were 60,000,000. This season they are practically *nil*. The winter's season will be a prosperous one. Great building activity is reported along all the lines leading out of that city. Recent advices from St. Louis show that much work is in the hands of architects. In Louisville and Cincinnati summer work is drawing to an end, and considerable winter work is contemplated, especially among the smaller manufacturing industries. The interior cities are holding up their credit, and dullness is not mentioned. The iron and steel makers are delighted at the almost unexpected rush of orders. The output has reached the highest limit. Pig-iron has advanced throughout the country from 50 cents to $1 per ton, as compared with summer prices. The advance has checked some expected business. Number 1 Foundry is $20 at tide-water; $18 for number 2, and $17 for gray forge — all best grades — with 50 cents to $1 less for lower grades. Mill owners are booking orders for winter. Rail-mill owners report increasing orders. Urgent buyers have placed orders in foreign mills for early winter deliveries. Large car orders have been given out. Ship-builders have an abundance of business in sight. The carriage and wagon makers have shops on ten hours on winter business as good as assured. The machine shops, and builders of all kinds of textile and shop machinery express no concern over the permanency of the present activity. Several New England machinery builders are working overtime. The only wanting factor is a large export trade in food supplies. In the long run, it is perhaps better that we should be saved from a fluctuating foreign trade. The food markets are not so liberally stocked as to stand an export drain for a long time without a speculative advance. Such an advance would create unrest among the workers and open the way for agitation for higher wages and shorter hours. The labor outlook is favorable to the permanency of friendly relations. Employers will not be taken by surprise next year, as they were last. Workmen themselves will be more conservative under organization. The leaders will throw their interests on the side of gentle measures. Yet contingencies are likely to arise which may precipitate widespread agitations, and produce harmful results. The building interests will be careful to ascertain the purpose of organized labor before the actual opening of next year's business.